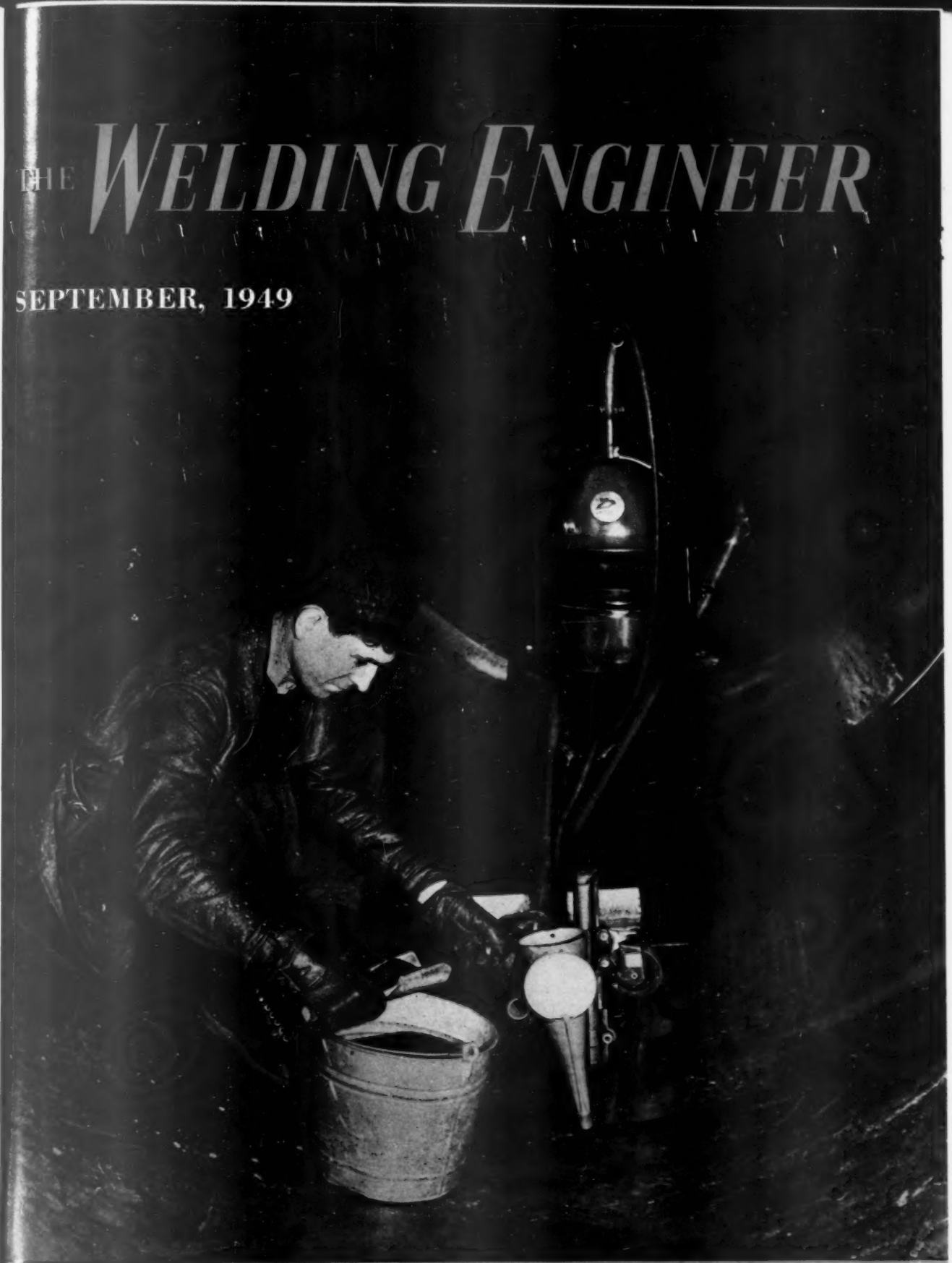
THE WELDING ENGINEER

SEPTEMBER, 1949



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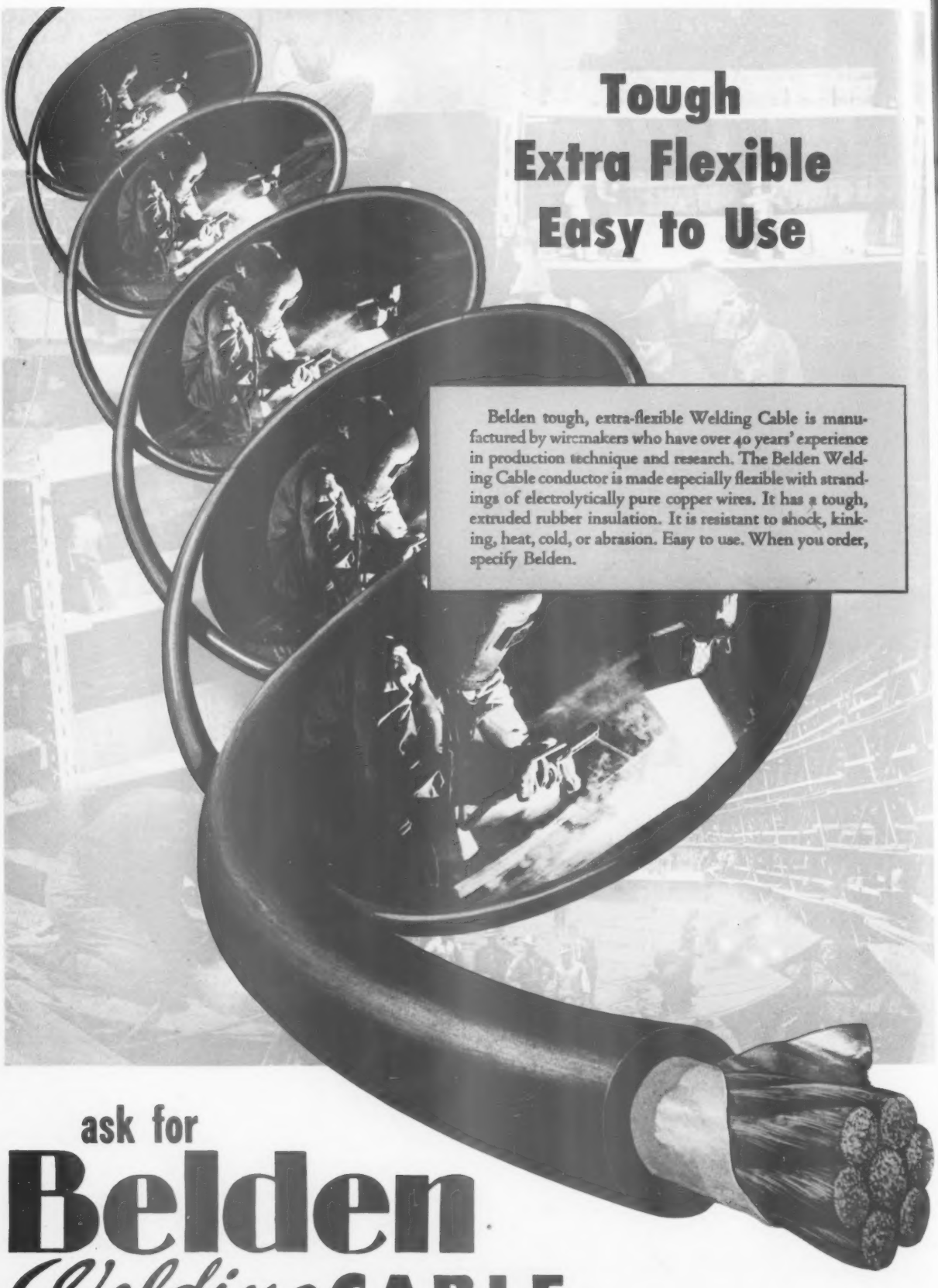

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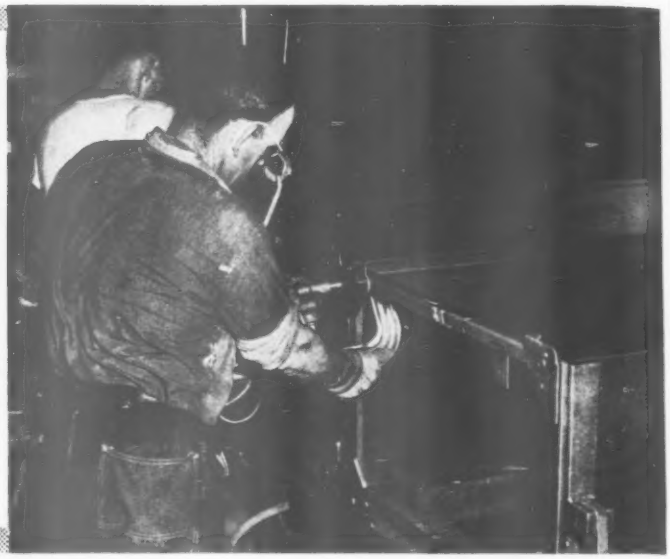
Mallory Fluted Welding Tips
Increase Production and Cut Costs!

Cross-section of Fluted Tip* used for spot-welding corner braces on 8 cu. ft. refrigerator cabinet at International Harvester's Evansville Works.

**Patent Applied For.*



International Harvester Makes Big Saving

Spot-welding operations on International Harvester 8 cu. ft. refrigerators were found in some cases to be *electrode eaters.* Harvester engineers discovered that after changing to Mallory Fluted Tips they were able to cut downtime and increase production per tip *by six times!*

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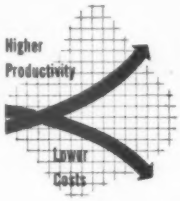
ESTABLISHED 1916 THE WELDING ENGINEER SEPTEMBER, 1949

Higher Productivity—Lower Cost



THE CHART symbol to the left will be found in conjunction with many articles which will appear in THE WELDING ENGINEER during the coming months. Higher productivity at lower cost is the greatest challenge facing American industry today. Unless it can be solved, our future does not appear to be too bright.

The continued industrial and social growth of our country is dependent upon the maintenance of a high productivity. Only high productivity and high sales can justify high wages.

Each successive wage increase since the war has been passed on to the consumer as a price increase. The cumulative effect has been disastrous. Many a product, especially those in the luxury or semi-luxury class, will eventually be priced out of the market unless costs can be lowered.

Many items are already priced so high as to produce a buyers' strike. People who still want radios, refrigerators, washers and hundreds of other items do not buy them because they are "waiting for the price to come down." Often their patience has been rewarded; the price *has* come down at the expense of some desperate dealer. But the initial reductions seem only to whet desire for still better bargains. Only through price stabilization at a lower level can we hope to escape the vicious spirals of a depression.

High productivity—mass production—has placed the automobile and countless other devices in the homes of millions upon millions of Americans. High productivity has always meant lower unit cost. Now we have high productivity coupled with high unit costs! How come this unnatural alliance? What's gone wrong?

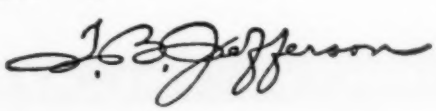
The reason is obvious: We are living today in an inflated world. Wages have increased to double their prewar levels, and the postwar dollar has only half of the purchasing power of its prewar counterpart. "The more you run the more you stay in the same place," the Red Queen told Alice. Twice as much money means a lot of running, but we stay in the same old place of no more purchasing power.

That, of course, does not make any of us happy. The laboring man wonders why his grocery bill and other expenses keep going up just about as fast as the contents of his pay envelope. So Labor presents additional wage demands, unaware that it is pursuing a mirage forever unattainable. Higher wages can only mean higher costs, which must be absorbed by higher prices—no additional purchasing power.

The happy solution is to lower cost. How can such a goal—desirable though it may be— be attained in view of high labor, high material costs and peak production? If production is already at a top level, it must be assumed that production costs are at a minimum since mass production affords the lowest cost. Yet production costs are the only ones that can be reduced because of the fixed nature of materials and labor. Is there a way to steer between the horns of this dilemma?

A concerted effort is being made by all McGraw-Hill publications, including THE WELDING ENGINEER, to answer their readers' most urgent question of the day: "How can we produce more and better goods at lower unit cost?" Obviously, it is a question that will have a multitude of answers: little savings here and there—none very startling, perhaps, and yet when all put together they may make an impressive total. Helping to find those many answers is today's big job of your business press.

High production and lower cost have been obtained in many plants by the more widespread use of welding and related processes. Every day finds more and more plants using welding, yet it is safe to say that not one plant in a hundred is using welding to the extent that it could. We can help obtain higher productivity at lower cost by doing a first class job of selling welding.



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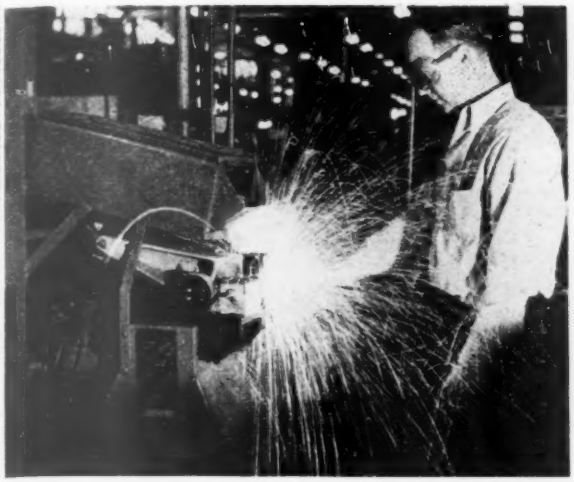
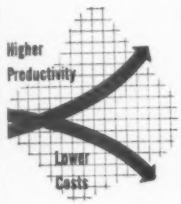


1—FLASH-BUTT welding is used to join the venturi to the mixer tube at the American Stove Co., St. Louis

2—MIXER TUBE and venturi unit is assembled in a fixture to be projection welded to the burner bottom

Projection Welding Speeds Gas Ranges



Production of Magic Chef ranges features a multiple welder with four transformers able to make 48 projection welds on the oven assembly in five seconds

3—STRENGTH of weld uniting the burner stamping and venturi tube is shown by above test specimen

BY GERALD ELDRIDGE STEDMAN

SINCE the days of the cumbersome cast-iron stove burning wood and coal, the kitchen range has progressively evolved into its present automatic glory of cooking efficiency. The American Stove Company of St. Louis has been behind much of this progress.

Around 1880, when the country took to kerosene lamps, the distillate by-product of gasoline, much more volatile at that time than it is today (the 70-72 deg Baumé), made possible the development of the gasoline stove. The manufacturers leading that advance finally merged to form the American Stove Company in 1902.

Forty Years of Progress

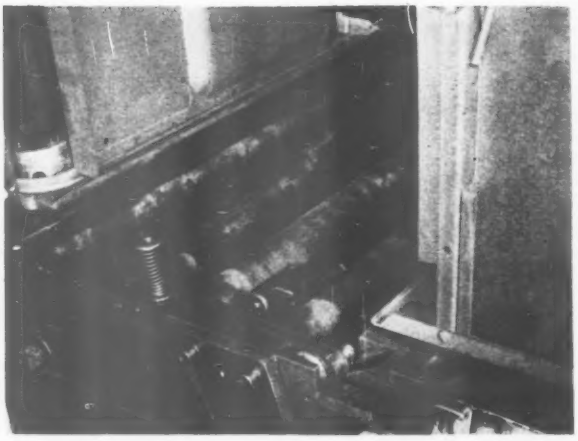
Electricity replaced kerosene, and the internal-combustion engine created a thriving market for gasoline. These trends caused the gas-light industry to seek a new function for its product in gas cooking. Just about that time the automotive trend encouraged an oil-refining change that made gasoline too heavy for gravity-tank stoves. New cooking developments were in order.

The American Stove Company perfected a succession of gas ranges of increasingly improved design. American Stove evolved an automatic regulator for oven heat that introduced the efficiencies of time and temperature control into cooking in 1914. This has now flowered into the fully automatic features of "Certified Performance" gas ranges. Adding to this progression, the company in 1929 brought out a revolutionary design which it called "Magic Chef." Finally, the first basic new models of a complete line of Magic Chef ranges, new from the base up, hit the production line in October, 1947. A prime characteristic in their revolutionary design was automatic production welding.

The new Magic Chef line contains many improvements resulting from extensive American Stove engineering research facilities. For example, A-S has just perfected a new high-temperature liquid called "Fenosil," one of the phenolic esters of silicon tetrachloride, which is liquid at room temperatures and still liquid up to 875 F, providing a greater range than any other thermo-responsive chemical. Thermostats using this liquid have a new range of baking temperatures.

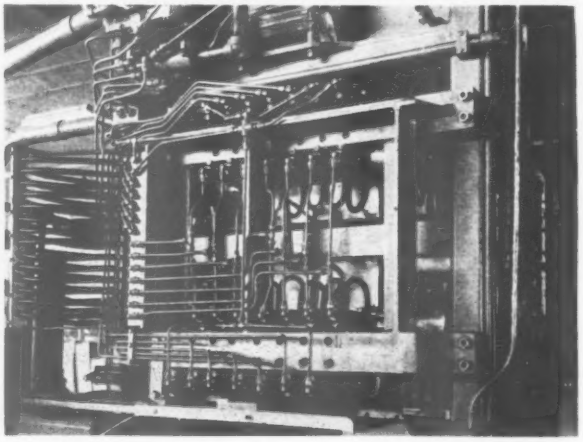
There are a number of similar developments, but none, I feel, are more constructively or functionally important than the American Stove developments in automatic welding. The functional benefits, of course,

4—ASSEMBLING PARTS on a fixture. A loaded fixture is traveling toward welder at a speed of 12 fpm



5—FINGERS ASCEND onto the fixture. Limit switch activates hydraulic mechanism that advances fixture

6—MULTIPLE WELDER in operation. Oven assembly beneath welder is ready to be lifted into position



7—CLOSE-UP of welding. A total of 48 welds are made in a series of six strikes in a five-second cycle

Oven assembly of "Magic Chef" involves automatic multiple welder, conveyors, elevator and fixtures

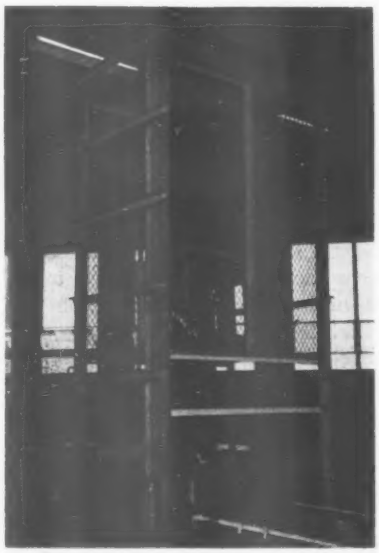
come from elimination of seams, nuts and bolts and their accompanying crevices for lodgment of cooking spatter to serve as breeding grounds for bacteria. In cleanliness, if for no other reason, the Magic Chef range strikes a new note in range construction.

New Line, New Layout

Introduction of this complete new line called for new plant, new tooling, new machinery, new layout, new enameling shop, new processes and ingenuity in finding new sources of steel supply. The advanced thinking of Arthur Stockstrom, president of the company and an able engineer, is diffused throughout the organization, encouraging many efficiencies in both engineering and production.

In view of the steel shortage, about 25% of A-S sheet steel has been secured by conversion. For example, ship plate may be purchased on the west coast, sheared in Chicago, rolled into sheets in an Ohio mill and re-freighted to St. Louis to be formed and finished. Scrap, ingots and plate have been bought wherever possible to be reworked into sheet steel. An open hearth has even been leased. It has taken monumental ingenuity to bring out the new line and to train the St. Louis plant labor force of 2,000 employes into a wide range of new processes, routings, schedules and skills.

My 1006th plant visit since 1942,



8—EMPTY FIXTURE is lifted by elevator to a gravity conveyor for return to starting position

my trip through American Stove was one of the most interesting. Robert Callan, chief engineer, has a staff of 15 under him, broken into five groups, who are in intimate touch with all phases of plant layout, tool design, factory practice, range engineering and inspection. George Eichelsbach, director of manufacturing and engineering, is exceptionally proud of this engineering staff, and, speaking of Callan, said he considered him "outstanding in automatic welding engineering." Much of the special welding fixture design required has incorporated the thinking of Mr. Callan, to whom I am indebted for the subsequent explanation of automatic welding practices observed on this visit.

Mixer Tube to Burner

First example is the flash welding of the venturi to the mixer tube (Fig. 1). The mixer tube is then projection welded to the bottom burner (Fig. 2), using 175-kva press-type welders. The assembly is manually loaded in the fixture, automatically clamped and manually unloaded. Production is 350 per hr. Strength of the weld is pictured in Fig. 3.

Formerly, the tube and bottom burner had to be flanged. The weldment was then accomplished by inert-arc or torch with low production. A change in the part design enabled the employment of projection welding.

The burner bottom is an oval stamping with eight peripheral projections of approximately ⅛ in. These constitute the contact points for the projection welds. They eliminate excessive current requirements and supply the essential mechanical strength to the weldment. A mechanical seal is created in forming the tube against the plate. Some 3¼ in. (lineal) of welding are involved. The burner bottom is formed of 20-gauge SAE 1010 sheet. The mixer tube is of steel tubing.

The effective seal of this periphery is proved by the fact that an average of only 25 leakers are developed in a day's run of 6,000 such venturi weldments. Not only has production increased 300%, but a much smoother air passage has resulted. The projection welds, after deburring, are perfectly smooth and leave no air turbulence to disturb the gas flow through the venturi.

A feature of Magic Chef design is its unified burner assembly, which prevents entrapment of spillovers. This assembly can be completely removed from the stove in an easy motion to be washed like any dish. It involves the automatic projection welding of five pieces: burner bowl, burner tray, front and rear venturi assemblies, flash tube assembly. The welding set-up for this uses a four-stage progression, each facilitated by a 35-kva welding tranformer, the four being synchronously timed by electronic controls. The welding fixtures are of American Stove design.

The five pieces are positioned and pressed together manually, in the welding fixture. The assembly receives a total of 24 projection welds. The progressive set-up of four groups involves a squeeze of six cycles and welding of four cycles with one cycle allowed between the welding. This automatic sequence requires three operators, and production is 350 per hour.

Oven Assembly

The most conspicuous example of American Stove technique in automatic welding is that of the oven. This involves an automatic multiple-welding unit, conveyor, elevator and fixtures. A production of 175 oven units per hour is achieved. The operation requires five men to get the material to, through and away. The force includes one bench assembler, two subassemblers, one unloader and a crew chief, who attends to the maintenance of the welder.

The multiple welder is accommodated by air-operated elevators and gravity roller return conveyor. The set-up is 55 ft long and 10 ft wide, the projection welder being mid-positioned and serviced by a 36-in.-wide conveyor belt traveling at a speed of 12 fpm.

The stampings are stacked side by side in bays. Their assembly occurs on a fixture at the start of the moving belt travel (Fig. 4). The parts assembled are the oven front frame, back frame, wrapper, sides and top. The assembled oven travels in its holding fixture along the moving belt until it is picked up by mechanical fingers (Fig. 5) just below the welder. When a limit switch is activated by the fingers, a hydraulic cylinder advances the fixture, which is then lifted upward into the projection welder (Fig. 6). The welding cycle is actuated by limit switches on the lifting mechanism. Welding (Fig. 7) is accomplished in a five-second cycle, involving 48 spots in a sequence of six strikes (8 welds at a time). Four 50-kva transformers are involved. The welded oven in its fixture comes out of the welder on the belt conveyor, is unloaded manually from the fixture. The empty fixture goes into an air-operated elevator (Fig. 8) and is lifted up to a gravity conveyor for down return to the unloading station at the end of the starting belt.

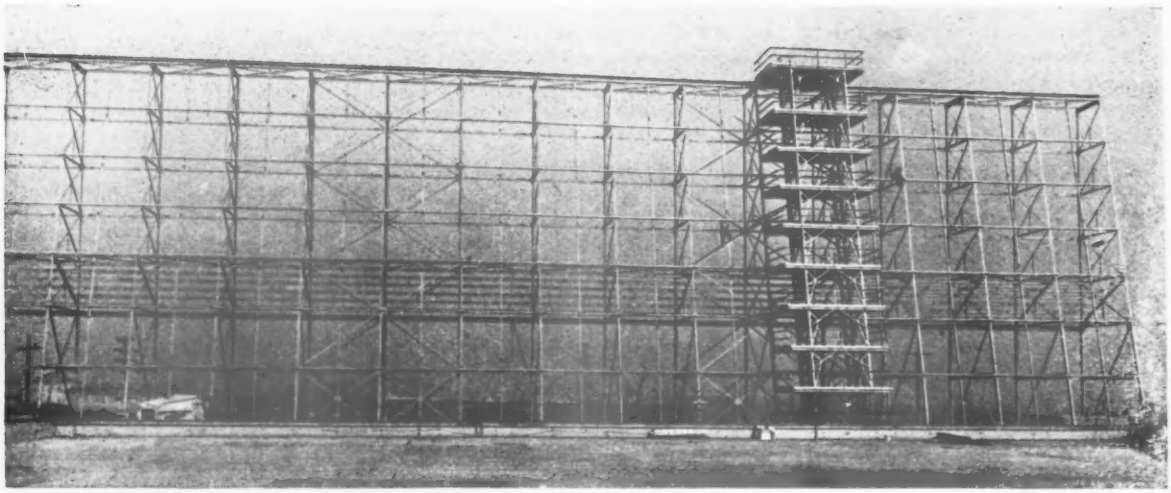
The stampings concerned in the oven assembly are made in a press area within 30 ft of their assembly position for projection welding. American Stove originated a practice of pickling stampings knocked down in make-ready to prepare them for porcelain enameling. This saves $300 a day through the elimination of excessive handling and in the greater space gained in the press room.

After welding, the oven units are loaded to truck dollies in loads of 36 and are moved to conveyorized storage in an area fronting the porcelain enameling department.

Plant on Cell System

The entire operation, including part stamping and welding of this oven unit, occurs in a shop area of less than 8,000 sq ft. Department layout is similar to many that characterize the American Stove policy of "integrated department" production. The aim is to complete the fabrication concerned in a basic unit within one department. Thus the American Stove plan is, in reality, a community of cells, each a complete factory within itself. This plan has many advantages. It gives a better line flow, less material handling, lower storage requirements, less stock in float, easier inventory and production control. Also, if inspection shows faults, they can be remedied on the spot.

Callan says that if he were to redesign the automatic projection-welding of the oven, he would make only one change. Rather than have the line move aloft after welding in its return to the unloading station, he would have this return parallel the advancing belt movement of the floor.



1—SKY BACKDROP steel framework was made to uphold "sky" behind artificial lake at the 20th Century-Fox lot

Apex Prefabricates S

Business of this unusual job shop is the prefabrication of almost any assembly or subassembly apt to be needed for structural steel construction. The larger the unit is, the better Apex men like it

BY FRED M. BURT

IN 1929, a new firm started operations in Los Angeles by using a tent for an office while buildings were being erected. It was known then as the Atlas Iron Works, and it manufactured manhole rings and covers as well as castings for oil drilling and pumping machinery. These products are still a major line in the company's present two foundries.

The men who did business in the tent were Earle V. Grover and D. L. Swinnerton. Today, Mr. Grover is president and Mr. Swinnerton, vice-president of Apex Steel Corp., Ltd., the same firm under a new name.

This same Mr. Grover has been accorded the great honor and recognition of being elected the 1949 president of the Los Angeles Chamber of Commerce. He is also active in the National Association of Manufacturers and the California Manufacturers Association.

Although the company has two foundries at its plants No. 1 and No. 2, what we are principally concerned with in this article are the layout, equipment and procedures at the new plant No. 3. This big steel fabricating plant was built in 1947 on a site 596 by 764 ft (about 10 acres). It was designed and constructed to be suited specifically in every detail to a wide range of fabrication and construction activities, including flame-cutting, submerged-melt welding and manual arc weld-

4—PRODUCTION SHOP in main structural bay, Apex plant No. 3. Gantry crane for the steel yard is at far background; welding shop in bay at left

2—FLAME-CUTTING for close fit

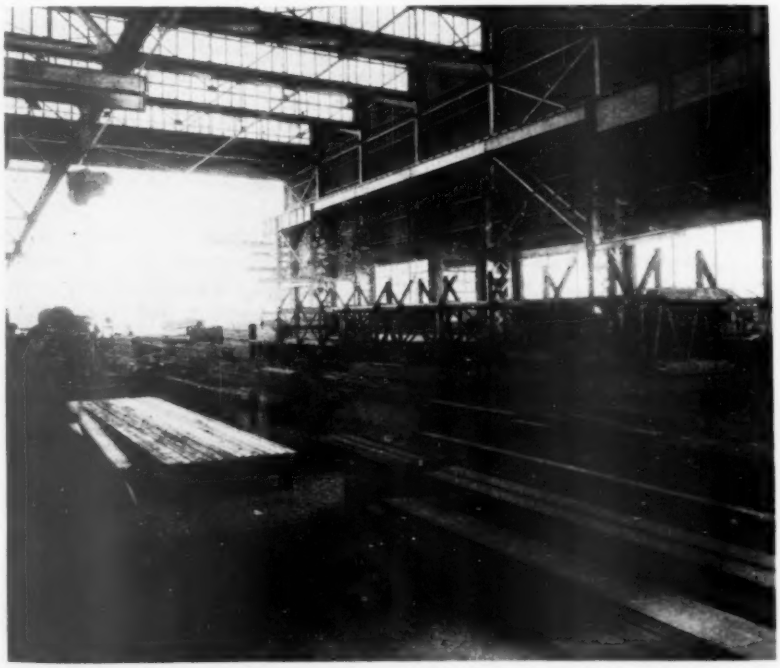
3—APEX-BUILT welded steel framework being erected for a factory building

Structural Steel

ing. The overall plan provides for ultimate inclusion of foundry and other manufacturing along with an additional large bay for extension of steel fabricating facilities.

About 2,000 tons are stored in the steel yard: wide-flange beams, 4 to 36 in.; I-beams, 3 to 24 in.; channels, 3 to 15 in.; angles, 1 by 1 in. to 8 by 8 in.; tees, 2 by 2 in. to 4 by 4 in.; flat bars, ½ in. to 6 in. wide; rods, ⅜ to 3 in. diameter; tank plate, 3/16 to 1½ in. thick, to 96 in. wide and 40 ft long; checker plate, 3/16 to ¾ in. thick, to 72 in. wide by 20 ft long.

A very successful innovation in the handling of this stock has been a 45-ton traveling gantry crane. It travels on a 350-ft track of 110-lb rails spaced at 24 ft apart. While not required at present, its cable allows a travel of 500 ft on either side of the reversing power reel. At its maximum high position, with a 30-ft extension, it will lift 45 tons with the main block. In the minimum low position, 98 ft out of the whip line, it will lift 6 tons on the whip line and 10 tons on the main block. Lifting capacity and extension are ample to enable the heaviest units constructed to be lifted onto flatcars on the nearby siding.



5—BRIDGE STRUCTURE for oil company takes form as component parts are fed in the points of use. Each part is paint-marked with job number

Shop Layout

The production shop (Fig. 4), under Superintendent Willard Grover and Foreman W. W. Newman, is the largest bay in the 240-ft-long building. Its 60-ft width is spanned by a crane carrying a 10-ton hoist, which serves the whole area and extends 170 ft into the adjacent storage and paint yard areas. The steel posts supporting the craneway also carry a craneway of 40-ft span for a 5-ton crane over the welding shop in the next bay. Lower and narrow tracks carry bridge cranes with hoists to serve subassembly and fitting operations. Power-line conduits to feed power to the cranes, welders etc., run through the center of the bay.

6—BIG GIRDER for the Kaiser open-hearth mill at Fontana, Calif., measures 86 in. wide by 70 ft long

7—LARGE I-BEAMS are made from three pieces of plate. Note the 60-ft-long jig used for tack welding

Girders and I-beams are fabricated by welding

In the construction of any steel framework, the welded or riveted subassemblies and structural parts are spotted alongside the skids on which the work will be done. Each unit is placed where it may be fed conveniently into the assembly (Fig. 5). The layout man marks each piece or subassembly with a paint stick, lettering on it the shop order number, detail sheet number, erection marks (such as B-31) and hole sizes (such as 13/16). The latter markings are visible after painting, bleeding through the paint for identification and guidance in erection.

Cutting, Welding Equipment

Arrangement and procedures thus allow for a system of continuous construction comparable to production operations along a continuous conveyor. Flexibility, however, is applicable to a wide range of jobs.

So great is the amount of flame-cutting done that oxygen is supplied in a single steel case containing about 40 cylinders hooked together in a manifold. The gas is piped to outlets at strategic locations in the plant. Acetylene is similarly piped from a manifold to the same outlets, but plans are underway to replace the cylinder supply with an acetylene generator.

A table 6 ft wide by 40 ft long is provided for cutting plate with a five-torch multiple flame-cutting machine. Additional flame-cutting equipment includes two straight-line single-torch cutting machines running on a track on a steel table and a radius-type machine that is used to cut holes up to 14 in. in diameter.

The welding equipment includes 30 arc welders located at points most convenient to the work to be done. Of these, 25 are a-c welders, mostly 500 amp, and five are 300-amp d-c welders. For erection in the field, there are two 300-amp portable welders driven by gasoline engines.

Among the many jobs contracted for and satisfactorily executed, one well illustrates what the plant is able to accomplish. This is the huge structural steel backdrop at 20th Century-Fox (Fig. 1), used to uphold the "sky" behind the artificial lake where sea, water and shipping scenes are shot. When ships rock to simulate the buffeting of waves, they rest on a big steel boat rocker, another Apex construction.

Prefabricated Skeletons

Broadcasting and movie studios, churches, markets, factory buildings, department stores, warehouses, pumping stations, schools and other diversified buildings are erected on Apex steel skeletons, some of which are all-welded (Fig. 3). Sometimes a little flame-cutting is required on the job to obtain the fit desired; Fig. 2, for example, was photographed during erection of the steel work for a supermarket at El Monte, Calif.

Huge all-welded beams required in the construction of a steel plant have been fabricated and trucked to the building site. Fig. 6 shows a welded 86-in. by 70-ft plate-and-angle girder loaded for delivery to the new open-hearth mill of the Kaiser Company, Fontana, Calif.

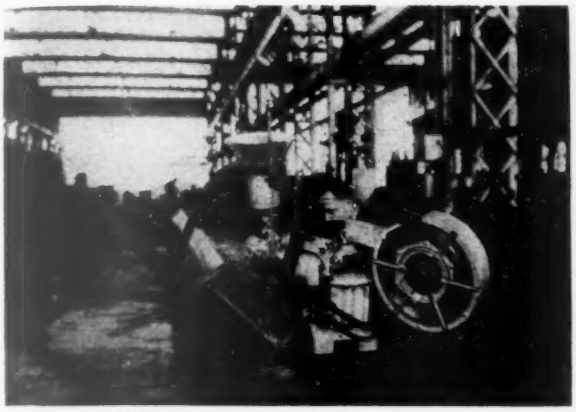
I-beams of large sizes are sometimes fabricated by means of welding and flame-cutting. First, strips of plate of the required thickness are cut with the multiple flame-cutting machine. The three strips that make up the I-beam are assembled on a jig 60 ft long, clamped and tack welded (Fig. 7). The crane then lifts the tack-welded structure to a nearby steel table where four long fillet welds are made with a submerged-melt welding head (Fig. 8).

Another Apex job was the fabrication of "dead man" anchorages for a Long Beach pier. One of these was made by flame-cutting a hole in the center of a 12-in. square steel plate, 1½ in. thick (Fig. 9). A 3-in. solid round was then inserted through the hole and welded to the plate on both sides.

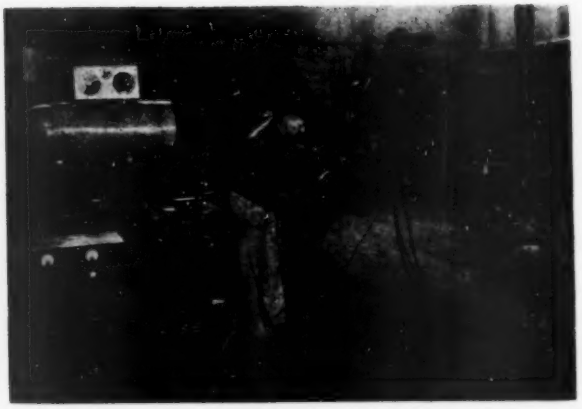
Foot bridges and similar structures such as are used at sewage disposal plants are completely fabricated, assembled and then disassembled for shipment to the point of use. Mezzanines, parapets, diamond-treaded steel steps, doors and other smaller building units are cut and welded to specifications.

It all adds up to a big job shop—one able to tackle successfully almost any type of job, the bigger the better.

Now let us see what sort of engineering and procedures are behind the varied constructions being built by Apex. First thing to note is that the heavy mechanical handling equipment functions in carefully planned continuous production, regardless of



8—TACK-WELDED I-BEAM (see Fig. 7) is completed by four fillet welds made with a submerged-melt head



10—AUTOMATIC hard-facing revolving mechanism is controlled by pushbuttons at hand of L. P. Marking

the size or shape of the structure and its subassemblies; the unit generally remains stationary as it grows while the parts are fed in and added to it.

Keeping Track of Work

A typical big job starts with the salesman. After he has secured permission to bid, he turns in the plans supplied by the contractor, subcontractor, owner or other principal to the estimators. These men list the materials required and costs on "take-off" sheets; possibly they also make small sketches of certain assemblies to aid in determining manufacturing procedures and costs involved. The detailed engineering, fabricating, painting, transportation and erection costs are determined, and the bid is made up.

9—ANCHORAGE unit for a Long Beach pier was made by welding a 3-in. round to a flame-cut plate

Let's assume that it is accepted and the contract signed. Proper shop orders are issued. The estimates are taken to the engineering department, under Chief Engineer Charles J. Goddard, to summarize the material into exact specifications as to size and shape. The perpetual inventory stock cards are checked to determine what materials are on hand. The stock required for the job is coded on the cards to show that it has been allocated and will not be assigned to some other job. Requisitions to the purchasing department are made for the additional materials and supplies required.

The job is then assigned to a squad of three in the engineering department—two detailers and a leader, who is also the checker. The latter consults from time to time with Mr. Goddard while the erection diagram of the building is developed (including only the steel work). This diagram is then detailed for shop drawings, which cover each individual fabrication regardless of whether it be a single piece or a combination of many pieces into a specific subassembly. After the drawings have been carefully checked, they are ready for submission to the architect or other customer representative.

A bill of material accompanies each drawing. From these bills, the cutting list is made up. Every individual piece of structural steel required for fabrication is then deducted (as previously coded) from the stock cards. Any remnants are entered in stock as shorts.

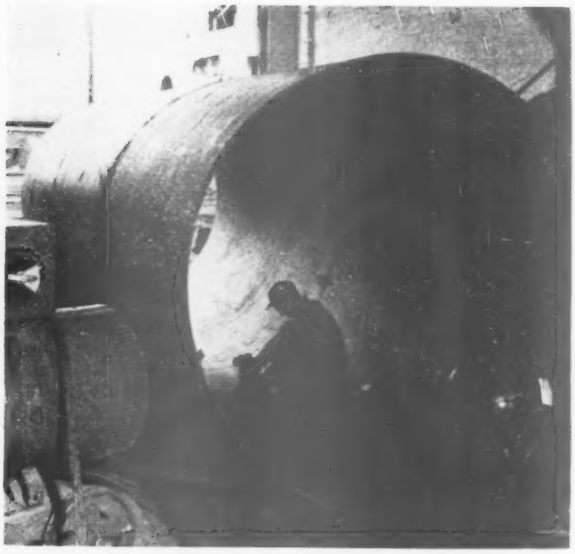
Three sets of drawings with all details go to the shop: one each to layout, fitting and shipping. The layout man uses the drawings to locate holes, cutouts, etc., center-punching all locations. The cutting list goes to the stock department for torch or shear cutting to exact sizes.

Above is an outline of the general procedure to this point, though it is never that simple. A vast amount of most careful work is needed in envisioning all of the problems of fabrication and erection. It would be too bad, for example, if no access was left for certain welding operations on an erection job. Care has to be taken to see that sort of thing doesn't happen.

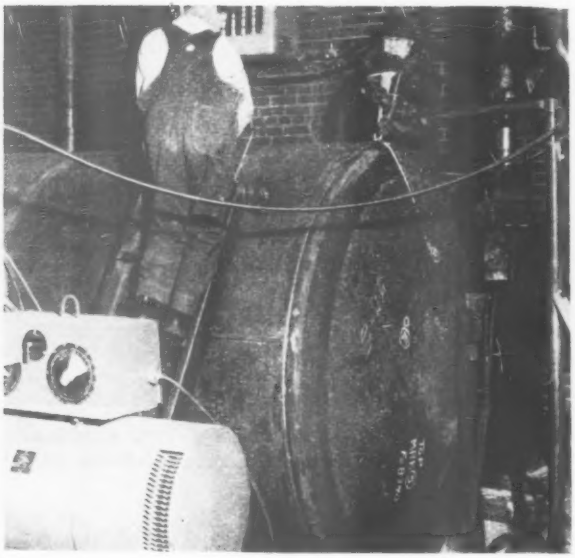
Automatic Hard-facing

Just ready for use at this writing is a new automatic hard-facing installation (Fig. 10). It is designed for building up worn construction-equipment parts such as ditcher rollers, shovel idler wheels, crusher rolls and cones, tractor idlers and rollers, bulldozer end plates, etc. The parts to be hard-faced are mounted on a positioner that can be tilted up to 180 deg and revolved at any speed from 0.2 to 2 rpm through gearing and a flexible shaft powered through a variable drive. Flux is fed down from a hopper as in submerged-melt welding. Two 400-amp d-c arc welders in parallel supply the welding current.

In this automatic process, the tough hard-facing metal is precision-applied in an unbroken stream to build up the worn surfaces to any desired depth. The D8 Caterpillar roller illustrated can be built up to its original size in from one to three passes (see page 44).



1—86-IN.-DIAMETER irrigation pipe is fabricated by semiautomatic submerged-arc. The "gun" is mounted on a fixed arm and pipe is revolved by turning rolls



2—EXTERIOR SEAMS can also be welded by raising stationary arm holding welding gun to the top of the tank. As in Fig. 1, turning rolls revolve the work

"Squirt Gun" Welding o

BY H. JACKSON
Plant Superintendent, Thompson Pipe & Steel Co.

"Squirt-gun welding is what they are now calling the semiautomatic submerged-arc process. It offers many advantages for fabrication of pipe up to 10 ft in diameter to carry irrigation water in the West

SINCE 1878, Thompson Pipe & Steel Co., Denver, Colo., has been furnishing fabricated steel products for the West. Hundreds of miles of Thompson steel pipe carry drinking water to homes in cities, towns and hamlets in the Rocky Mountain region. In particular, Thompson Pipe & Steel has pioneered the development of superior pipe for long-spanned applications to transport water over roadways, canyons, canals and streams. Some of the self-supporting, long-span pipes are as large as 123 in. in diameter and span 84 ft. In another instance, an 84-in. pipe is self-supporting over a 134-ft span. Such applications as these are possible only by welded fabrication.

Thompson Pipe & Steel Co. uses all types of fusion welding. Arc welding is most popular, both manual and submerged arc, with automatic and semiautomatic applications of the latter.

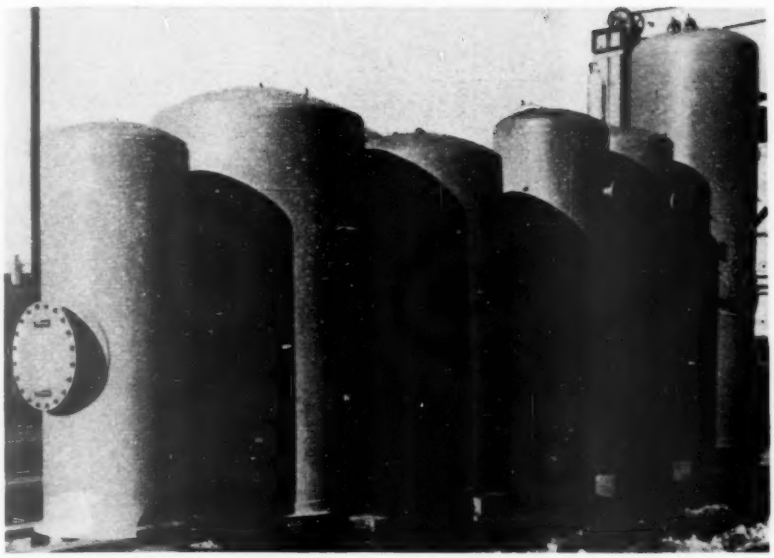
Recently, semiautomatic submerged-arc equipment has become increasingly popular. The welder used for this "squirt gun" welding application is a self-sufficient portable unit providing all the necessary welding current, auxiliary power, automatic wire-feed mechanism and controls. The power supply is a standard welding generator, which may also be used for manual d-c welding. Mounted on or near the welder is a compact unit containing the wire reel, feed mechanism, drive motor and voltage controls. A special cable and welding gun consisting of a cone-shaped flux container and the welding head complete the equipment.

SEMIAUTOMATIC WELDING

This type of semiautomatic equipment is being employed advantageously for the production of large-diameter pipe and tanks (see front cover). In the fabrication of cylindrical products, the shell is rolled to size and a back-up bead is run manually along the longitudinal seam to hold the cylinder in proper position. The fabrication from then on is of a semiautomatic nature.

The manual submerged-arc welder uses 5/64-in. electrode wire, which is fed automatically from the reel to the welding gun through the special welding cable. The cable has a coil-spring center core to guide the electrode. It is of stranded copper, rubber covered, and provides a light, flexible carrier for both the welding current and electrode wire.

The conical flux container of the gun is filled with a granular flux similar to that used in automatic submerged-arc welding. As the wire moves through the welding gun to the work, flux is fed by gravity around the electrode and the arc. The rate at which the flux is fed will depend upon the size of the orifice. The flux container is refilled (usually by hand) without interrupting the weld.



3—TANKS FABRICATED by "squirt gun" welding at Thompson Pipe & Steel Company. Note variety of work and uniformity of the welded seams

# of Huge Pipes

The welding operator may hold the welding gun in one hand and guide it manually along the joint to be welded while obtaining the semiautomatic operation of the submerged arc. Manual operation is excellent for following irregular seams or when welding must be done in nearly inaccessible spots.

In straight-line applications on either flat or cylindrical objects, it is possible to obtain a uniform speed of travel that will assure the weld quality of fully automatic welding. This may be accomplished by mounting the welding gun and moving either the gun or the work at a uniform speed. On straight joints, for example, the gun may be mounted on the motor carriage of a flame-cutting machine so that the welding head moves along the line of the weld. Again, it may be mounted on a fixed arm while the items to be welded move under the head at a uniform speed. This can be accomplished by mounting the work on a slow-moving planer table.

When straight-line welds are made on cylindrical surfaces, the welding gun is usually mounted in a fixed position and the cylindrical workpiece is rotated under it, either by a positioner or by turning rolls. The welding gun can be mounted in a fixed position and the work revolved past it wherever the line of welding is a true circle.

Welding 86-in. Piping

Fig. 1 pictures an 86-in. diameter irrigation pipe having ¼-in. wall. Several courses have been tack welded together and mounted on turning rolls for the welding of circumferential seams by semiautomatic submerged-arc welding. Beveling of the plates is not necessary on ¼-in. material. Note how the welding head is mounted on a fixed arm, which also carries the welding reel and control mechanism. The operator locates the head over the joint and starts the turning roll. His job then becomes one of keeping the conical head filled with flux and vacuum cleaning the surplus flux behind the weld. A current of 400 amps at 32 volts was employed, and the welding speed was 30 ipm. After the interior beads were deposited, the arm was moved to the outside for the exterior welds.

Fig. 2 pictures the welding of a head on a tank. The set-up for an external circumference weld is essentially the same as for an interior weld except that the gun fixture has been raised.

A variety of tanks fabricated by semiautomatic submerged-arc welding may be seen in Fig. 3. Note the uniformity of the bead.

Scallops by Flame-Cutting

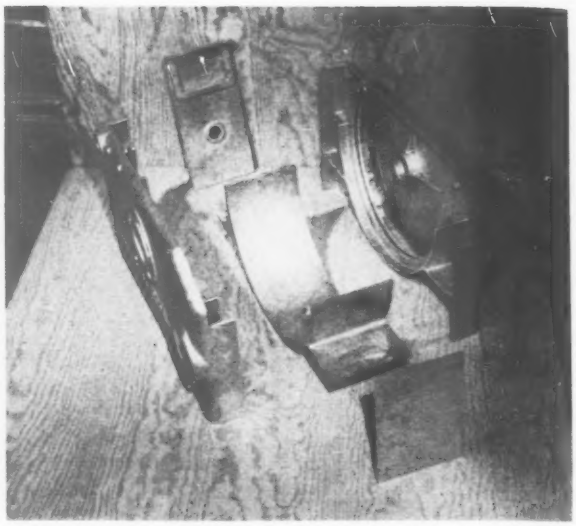
While many flame-cutting applications are carried on as a matter of routine, one of a unique nature is employed to produce semicircular headers for use on corrugated plate. The manner in which this operation is carried out is shown in Fig. 4. The objective is to divide a piece of pipe of the proper diameter into halves while flame-cutting scallops which will enable the pipe to fit snugly in the corrugations.

All but the upper surface of the pipe to be cut is submerged in a tank of water. The cutting is done by an automatic machine which travels the length of the pipe as the tracing device moves along a template. Regardless of its complicated shape, the finished pipe is warped only slightly. Much time that would normally be consumed in straightening it is therefore eliminated.

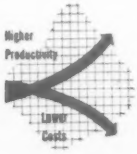
These and other ingenious methods used in the Thompson Pipe & Steel plant are well illustrative of the way in which American industry is employing welding and flame-cutting.

4—FLAME-CUTTING pipe with scallops to fit against a corrugated plate. To minimize distortion, the length of pipe is almost submerged

1—SEPARATOR for coolants. It removes magnetically metallic particles produced by machining operations



2—BASIC CASTINGS for sides, inside spacer and end plates of a "Barnesdril" No. 2 coolant separator



Inert-Arc Helps M

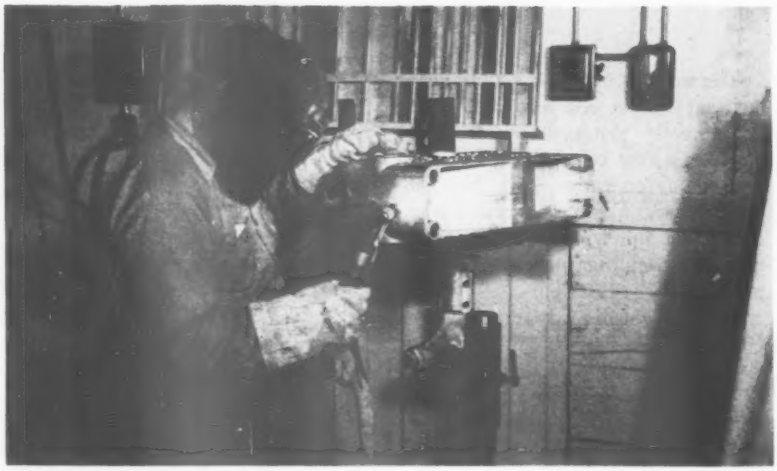
BY N. D. O'DANIELL
Barnes Drill Co.

BARNES Drill Co., Rockford, Ill., manufactures a magnetic coolant separator, purpose of which is to remove metallic particles from the coolants employed in a wide range of honing, grinding, milling, broaching, shaving and forming machines. Desiring to improve its standard product, the company originated a new design requiring a new-type drum housing to be cast of aluminum. The design was taken to the foundry, Sall Brothers Co., another Rockford concern.

The foundry took a look and let out a yell. The five-sided boxlike housing looked like one of the toughest jobs that Sall Brothers had ever faced. Production would be costly; troubles could be foreseen in attaining uniformity of wall thickness. Since there were four different sizes of coolant separators, four separate complicated molds would have to be made. Undoubtedly, the rejects of such complex castings would be high.

Could Cast Separate Parts

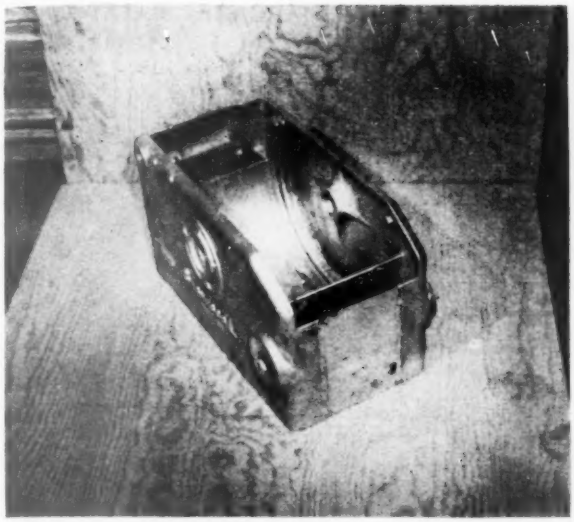
There is always a way out if you are willing to look for it. Here the obvious way to escape the difficulties outlined in the previous paragraph was to cast the aluminum drum housing in separate parts and assemble them into the finished housing. The parts could be assembled by bolting or riveting, which would add extra costs and introduce possibilities of leaks and other weaknesses. Or they could be welded. Yes, but to weld cast aluminum on a production basis? At this point in the planning, a supplier of welding equipment was called in for a conference. It was decided that the parts could be joined by inert-arc welding.



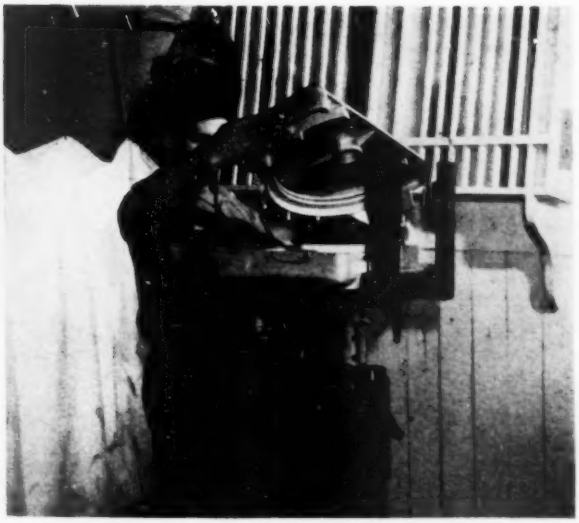
5—TACK WELDING of assembled parts is done by the inert-arc process

Considering first the No. 0 or smallest separator, it was planned to cast the housing in two parts: the nameplate side and the motor side. For the larger sizes, Nos. 1, 2 and 4, the same side castings could be used as used in the No. 0 size. To produce the larger drum housings, it would only be necessary to separate the side castings by three simple cast spacers.

Fig. 2 is an "exploded view" of side castings, inside spacer and end plates for the No. 2 coolant separator. It will be noted that none of

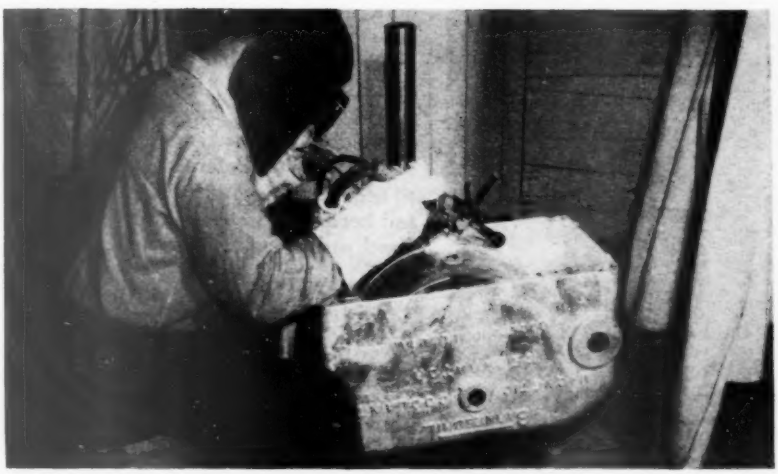


3—COMPLETED HOUSING. Cast aluminum parts pictured in Fig. 2 have been joined by inert-arc welding



4—FIT-UP on a turning fixture is the first step in assembly of the five castings that make up housing

Make Castings



6—FINISHED WELDS are made on a positioner in the downhand position

these parts are in any way complicated from the standpoint of green sand casting. Fig. 3 shows the completed housing.

Ever since the start of production, the welding has proceeded as planned. First the parts are fitted up on a turning fixture (Fig. 4) and then tack welded by means of the gas-shielded arc (Fig. 5). Before making the finished welds, the tack-welded housings are preheated to about 400 F. This allows much faster welding than is possible with cold parts. C-clamps hold the housing on the positioner for the finished welds (Fig. 6), all downhand.

One Every 20 Minutes

Except for two short fillet welds, the parts are joined entirely by straight butt welds. Most of the latter are made by fusing the parent metal without the addition of filler metal. A 3/16-in. aluminum rod is used in end conditions and where the metal of the casting has an extra-thick section. The latter is exceptional since practically all wall thicknesses of the castings are ¼ in. Weld penetration is 85 to 100%.

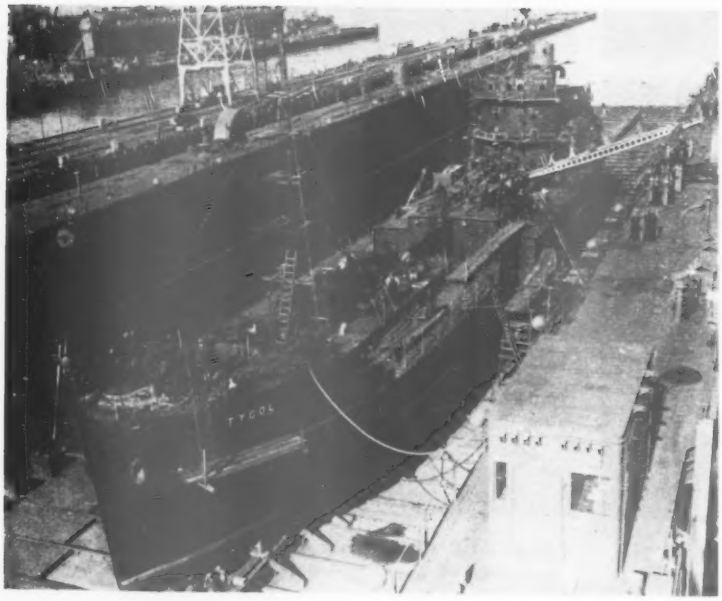
An alternating current of 200 amp is used with a 3/16-in. tungsten electrode and argon gas flowing through the electrode holder at a rate of about 12 liters per minute. Welding speed is about 14 ipm. Total welding time for the larger housings is about 20 minutes, which includes turning and positioning. About 14 ft of welding are required on these larger housings.

Fig. 1 shows one of the separators in operation. The used coolant from the machining operation flows into the separator directly from the machine. The flow is through a restricted area between the separator housing and a cylindrical drum carrying a number of permanent "Alnico" magnets. The drum rotates in the opposite direction to the coolant flow, and the metallic particles in the coolant are drawn by the magnetic field to the drum shell, where they are held until they are automatically scraped off and deposited in a removable container.

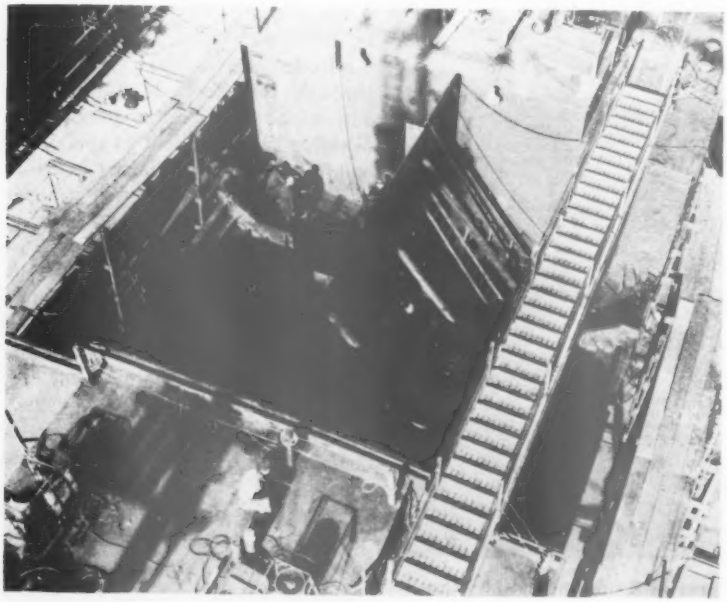
After passing through the restricted area, the coolant flows from the separator into the clean coolant compartment of the machine.

The combination of aluminum castings and final assembly by means of inert-arc welding has produced better housings for Barnes separators at far less cost than could be produced by the casting process alone.

Photos courtesy The Linde Air Products Co.



LENGTHENED TANKER in drydock. Ship was cut amidships, and prefabricated sections were welded in between the two parts of hull



BOTTOM SHELL SECTIONS, port and starboard, have been added to the tanker, and centerline bulkhead has been raised into position

Tanker Gets New Midsection

Tanker *Tycol* was lengthened 30 feet for civilian service by cutting it in two with torches and then welding into place a new midsection prefabricated at a San Francisco shipyard

BY MARGARET RALSTON

A 211-FT Navy tanker of the AOG type was lengthened 30 ft for civilian service in a recent conversion job at the San Francisco yard of Bethlehem Steel company's shipbuilding division. Renamed the *Tycol*, the former *Ochlockonee* will be used by Tide Water Associated Oil Co., Bayonne, N. J., in its trade along the east coast.

Ship Cut Apart

The conversion job was the first of its kind to be done on the west coast. The ship, put in drydock, was cut apart amidships with oxyacetylene torches and pulled apart through the ground ways and sliding ways method. Then new sections, prefabricated in the Bethlehem shop, were welded piecemeal between the two parts of the hull. It sounds simple, but it represented a lot of work.

In the conversion, ways and blocks were positioned on the drydock before the tanker was docked. The ship was floated in and landed on the keel blocks. After she was cut in half, the same ground ways procedure used in launching a vessel was carried out. This included fitting all skin blocks, wedges and ramming up and splitting out of all keel blocks. The tanker was pulled apart with one of the drydock wing-wall capstans, which in this case exerted a pull of about 4 tons. Before she was cut in two, all necessary bench marks for the centerline and horizontal water line were put on the vessel with a surveyor's transit.

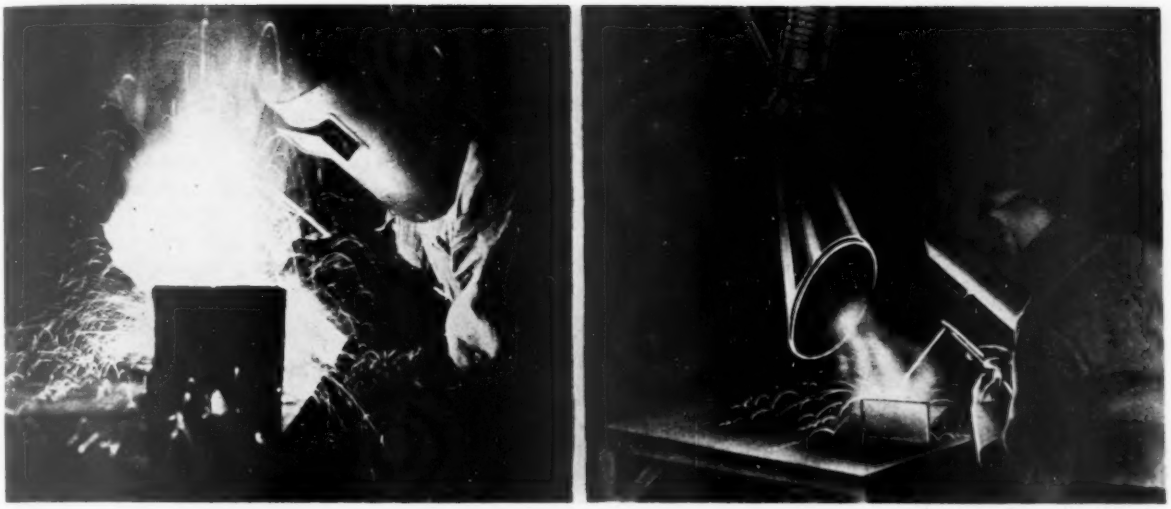
16,460 Ft of Welds

For the prefabrication job, the company employed 400 and 500 amp a-c welding transformers for 10,660 ft of welding, in which 3,394 lb of 3/16, ¼ and 5/16 in. welding electrodes were consumed.

To join the prefabricated assemblies to the two halves of the ship, weldors used 1,000 and 1,500 amp d-c generators with a grid system. Another 5,800 ft of welds were made, requiring 1,834 lb of 3/16 and 7/32 in. electrodes. Of the total 16,460 ft welded, about 600 ft were submerged-melt welds, made to join the ½-in. hull plating and longitudinal and transverse bulkheads.

Conversion requirements elsewhere on the ship brought the total welding footage to 29,000 ft and the total weight of electrodes to 9,174 lb.

Charles Mellendeck, assistant marine superintendent of Tide Water, supervised reconstruction of the ship for the oil company.



Courtesy Ruemelin Mfg. Co.

SMOKE CLOUDS and poor vision are characteristic of welding done without fume collection. On the right is a ventilating hood to draw the fumes outdoors before they will have a chance to rise and spread throughout the shop

Health and the Weldor

Welding is one of the healthy professions, comparatively speaking, and such health hazards as it does present may be guarded against by assuring adequate ventilation, eye safety and proper clothing

BY PHIL GLANZER

WHEN metals are heated to a high temperature, some health hazards are presented to the worker. The principal health hazards associated with the welding, brazing and cutting of metals (apart from the slight danger of electric shock) may be listed in three general categories:

Illness due to the inhalation of toxic gases and dusts arising from the use of fluxes, coated rods and the ingredients of the metal itself.

Damage to the eyes from exposure to radiant energy or from flying particles of metal.

Skin burns due to (*a*) radiant energy or (*b*) contact with hot objects.

Inhalation of Fumes

The harmful substances emitted when the arc and/or oxyacetylene flame is used in welding, brazing or cutting may be divided into two classes: (1) gases, (2) microscopic particles.

Depending upon the particular process, there may be found one or more of the following gases present: carbon monoxide, carbon dioxide, oxides of nitrogen, ozone; under certain circumstances, fluorine, silicon fluoride and hydrofluoric acid.

Table I. Air Requirements per Minute per Person

Steel electrodes	*Small room with low ceiling*	*Large room with high ceiling*
5/32 in.	250 cfm	500 cfm
3/16 in.	400 cfm	800 cfm
1/4 in.	700 cfm	1,400 cfm
5/16 in.	1,200 cfm	2,400 cfm
3/8 in.	1,500 cfm	3,000 cfm
Fluoride-coated alloy electrodes		
5/32 in. or less	250 cfm	500 cfm
Galvanized plate		
5/32 in.	1,000-1,500 cfm	2,000-3,000 cfm

Courtesy Mine Safety Appliances Co.

RESPIRATOR of type above has a twin filter unit and provides approved protection for work on metals bearing zinc, lead or cadmium

Eyes

Courtesy Willson Products, Inc.

"FLIP-FRONT" welding helmet has tinted lens and cover glass in the movable front section, clear glass in the stationary section so that the weldor can inspect his work without removing the helmet

Courtesy American Optical Co.

GOGGLES of the "head-rest" type fit snugly against the head to prevent any entrance of light from the side. This gas weldor is also protected by a jacket of chrome-tanned leather and leather gloves

Table II. What Lens Shade for What Work

Shade No.:	*Operation*
3	Low-temperature work-heating furnaces, lead burning, very short-period welding observations.
4	Smelting furnace, light flame-cutting and welding.
5	Short-period flame-cutting and welding as in maintenance work.
8	Heavy oxyacetylene welding, arc welding not over 20 amp.
10	Arc welding up to 200 amp.
12	Arc welding over 200 amp.
14	High-amperage arc welding, atomic-hydrogen welding.

Of the chemical compounds which appear as finely divided particles, iron oxide, manganese dioxide, silica, chromium oxide, calcium fluoride and sodium fluoride are most commonly encountered. Lead oxide is encountered when lead-containing paint is burned, and should be definitely listed among the harmful materials. The welding or cutting of galvanized metal results in the formation of zinc oxide, which produces metal-fume fever when inhaled.

It should be noted that extremely toxic fumes are evolved from the presence of cadmium at temperatures far below those produced by the arc or oxyacetylene flame. The greatest precautions, therefore, should be taken when heating materials containing or plated with cadmium.

There will be little danger to the weldor's health from any of these substances, provided that ventilation is adequate. What constitutes adequate ventilation, however, cannot be defined within a few words. Ventilation adequate for work on mild steel would not suffice for lead burning, where respirators or air-supplied masks must be worn.

In what follows, a distinction is drawn between "local exhaust" and "general ventilation" systems.

Local exhaust implies a means of suction to draw the harmful gases and dusts away from their source as soon as they are evolved. In practice, this is accomplished by the use of an exhaust fan to which a hood or opening is connected by piping. The use of flexible piping between the suction fan and the exhaust hood meets the problem of local exhaust even in confined spaces. The hood is placed close to the source so that all of the gases and dusts produced are removed by the fan. The contaminated air leaving the fan is ejected to the outer atmosphere, where it is rapidly diluted.

How Much Air to Move?

The amount of air which the fan must remove per minute to eliminate the gases and dusts depends upon:

1. The distance of the exhaust opening from the source of the harmful dusts and materials.
2. The rate at which the exhaust air crosses the source.
3. The area of the opening into the exhaust hood.
4. The size and length of the piping joining the exhaust hood to the fan and the size and length of piping leading from the fan to the outer atmosphere.

Let us take up each of these factors separately:

A distance of 9 in. is accepted as the maximum distance which the exhaust opening need be from the source of harmful materials. In making a long weld, the welding rod or electrode must be replaced about every 9 in. When he replaces the rod, the weldor can also relocate the exhaust hood.

Experience has shown that the velocity at which the exhaust air crosses the source must be not less than 45 fpm if the harmful gases and dusts are to be removed by suction.

The area of the opening into the exhaust hood depends upon the type of work being done. In the majority of cases an opening of 12 sq in. (2 by 6, 3 by 4, etc.) is satisfactory.

The resistance to the flow of air depends upon the size and length of piping on the intake and outlet sides of the fan. Flexible piping of 4-in. diameter is quite commonly used to join the exhaust hood to the fan or to the header leading to the fan if the latter serves to exhaust air from a number of hoods. Because the size and length of piping has such an important bearing on the type of

Clothing

Courtesy American Optical Co.

WHAT WELL DRESSED arc weldor should wear to be properly safeguarded against flying sparks. His wardrobe includes a short leather jacket, overalls of chrome-tanned cowhide, leather welding gauntlets

exhaust fan which will be most suitable, these dimensions should be specified when the purchase of fan equipment is contemplated.

Obviously, an adequate provision must be made to permit the entrance of replacement air.

Ventilation by local exhaust eliminates fume hazards at their source and should be employed wherever possible. It must be remembered, however, that efficient results can be obtained only with the coöperation of the weldor and the strict supervision of the foreman in seeing that the exhaust hood is properly placed.

General Ventilation

When a local exhaust is not used, the gases and dusts will diffuse into the general air of the room or enclosure. Unless this air is replaced at frequent intervals, a toxic concentration of the harmful substances may be reached. To keep the concentration within safe limits, general ventilation is necessary. This may be accomplished by the use of ventilation exhaust fans.

As in the case of the local exhaust, it is extremely important that provision be made to permit the entrance of uncontaminated replacement air. Such fans and replacement air entrances should be so situated that the resulting movement of air tends to draw the gases and dusts away from the breathing area of the workers.

Table I gives the number of cubic feet of air per minute per person which must be replaced.

Respirators

Under exceptional circumstances, neither local exhaust nor general ventilation may suffice to protect the weldor's health. When working on lead-bearing materials, for instance, the weldor should be equipped with a respirator especially designed to be worn beneath a welding helmet or shield. Some respirators make use of air filters while others are of the "supplied-air" type. Welding in confined spaces such as the interior of a tank should never be carried on without special air supply.

Eye Protection

If the worker's eyes are not protected, they may receive permanent injury from flying particles of hot metal and from harmful ultraviolet rays. These two eye hazards have long been recognized by weldors. To guard against the rays, the arc weldor wears a helmet or carries a shield; the gas weldor wears goggles. Cover lenses of clear glass are used to protect the colored lenses of helmets or shields from being spattered by particles of hot metal. These helmets, shields or goggles, with their appropriate lenses and cover glasses, fully protect the weldor's eyes from flying particles and injurious radiant energy.

Since the intensity of the emitted light depends upon the types of operation, different "shades" of lenses have been developed. Table II shows the approved shade of lens which should be used for a given kind of work.

Watch out for These

Even with approved lenses and mountings, occasional cases of "sore eyes" due to harmful radiation may occasionally occur. In general, these cases may be traced to one or more of the following causes:

Inexperience: An inexperienced arc weldor will often strike his arc before he puts his helmet or shield into position. This is a natural thing to do but should under no circumstances be tolerated. One of the duties of the supervisor should be to make sure that the act is not repeated.

Poorly fitting equipment: Poorly adjusted goggles, helmets or shields may allow either direct or reflected light to strike the eyes and hence be responsible for injury. It should be the responsibility of the supervisor to see that the eye guard, whatever type it may be, is adjusted properly to each individual.

Side flash: Without intervening partitions, the light from a weldor's arc may reach the unprotected eyes of other types of workers. This danger is avoided by welding booths. Where permanent booths cannot be used, lightweight screens of metal or heat-resisting material should be placed to intercept the "side flash." Space should be left between the floor and the bottom of such screens to allow for proper ventilation.

Poor quality lenses: From time to time "cheaper but just as good" lenses are placed on the market. Make sure that such lenses have been approved by a reputable authority before they are purchased. Should there be any doubt as to the quality of a lens, a spectrum analysis should be made of its light transmission.

Skin Burns

The light emitted by the electric arc contains ultraviolet rays similar to those given off by the sun. Continued exposure of the unprotected skin to these rays may cause a burn similar to a severe sunburn. By covering the skin with material which will not transmit ultraviolet radiation, these burns can be readily prevented. Since the weldor is fully clothed and wears a helmet that covers his face, his wrists and hands need only to be protected by gloves to render him secure against ultraviolet skin burns.

Burns occurring from contact with hot metals are not so easy to guard against and may cause serious complications. To prevent injuries, gauntlet gloves and arm guards should be available for workers' use. For full protection, other safety clothing may be worn, such as leather jackets and overalls. Many a weldor has had his pants burned by flying sparks; leather aprons will help prevent this as will leggings or spats. Safety shoes should be worn, too.

1—CARBON PLATES were built around weld area to retain the molten filler metal and parent metal. Carbon paste closes chinks and cracks at the edges of mold

2—PREHEATING bracket area on press frame. Four torches burning city gas brought temperature up to 1,400 F in three hours. Asbestos paper confines heat

Carbon Arc Welds C

BY WILLIAM C. HENZLIK

Instead of the conventional oxyacetylene method, the carbon arc was called upon to rejoin broken brackets to the cast-iron frame of a toggle drawing press. It meant important changes in the procedure

DISASTER befell an 88-ton toggle drawing press while it was engaged in the manufacture of electrical appliances at the Quadrangle Mfg. Co., Chicago. One of the four brackets at the top which hold the toggle mechanism of the double-action press broke off completely at the bearing cap. Another bracket cracked almost through. Each of the broken brackets measures 16 in. across and is also 6 in. thick. Reinforcement of approximately 50 lb of cast metal was added.

The 30-year-old press is of a type that is no longer being manufactured. However, it offers certain advantages for deep drawing such as simple operation and simple dies, which advantages Quadrangle desired to retain. Accordingly, the broken press was farmed out for repair to the Haberkamp Grass Machine and Metallizing Works, which in turn subcontracted the welding job to Western Welding & Repair Co., 1434 West Lake St., Chicago, J. M. Jardine, proprietor.

Ordinarily, the Jardine shop would have welded or brazed the ten-ton cast-iron frame by means of the oxyacetylene torch. However, the press came in at a rather bad time, for one of the shop's two skilled oxyacetylene weldors was in the hospital for a series of operations, and the job was simply too big for the remaining man to handle by himself. Proprietor Jardine, one of the early experts on the carbon-arc welding of heavy steel mill and metal fabricating machinery, decided to use this process and do the work himself in order to avoid delaying the repair.

The decision to use the carbon arc meant important changes in the usual procedure. More preheat is required, for one thing. The arc is much hotter than the oxyacetylene flame (6,850-9,550 F), and is also much more concentrated. The heat of the lower-temperature gas flame is dissipated over a larger area so that the temperature differential between point of weld and the balance of the part is not so marked.

The extreme heat of the carbon arc reduces filler metal and parent metal to a completely fluid state, and it is necessary to build a dam or mold of carbon plates (Fig. 1) in order to retain the molten metal within the weld area. Chinks and cracks at the edges of the mold are filled with carbon paste to make a wholly tight enclosure.

Preparation and Preheat

Nature of the break did not necessitate chipping or other tool operations before fit-up. With the carbon-arc process, a clean break needs only to be accurately aligned, though it is necessary to remove burrs and rough edges in order to facilitate fit-up. Cleaning of the surfaces to be joined is a good idea, but it is not necessary to do as careful a job of cleaning as with other types of welding. The extreme heat of the arc will burn out many types of impurities. The surfaces of the work are not fluxed, but the filler metal was precoated with a commercial flux designed for cast-iron welding.

Preheating was done with four

3—SMALL HOLE was torn from asbestos sheet to provide access. Weldor J. M. Jardine, Western Welding & Repair, was assisted by his son-in-law G. A. Ricker, Jr.

4—SMALL CHUNKS of filler metal are dropped by Mr. Ricker, the helper who is standing to the right of Weldor Jardine, into molten puddle created by the carbon arc

ds Cast-Iron Press

large torches on pedestal holders. The torches, burning city gas, were played on the weld area from 8 a. m. to 11 a. m. to build up a temperature of 1,400 F. This three hours of preheat were given to the work on each of the three days required for the repair. The high preheat temperature was necessary as no more heat could be added during the entire two-hour period of welding, and hence the initial temperature could not be maintained.

Large sheets of asbestos paper (Fig. 2) were placed around the weld area to deflect the flames onto all parts of the break and to confine the heat. Asbestos paper was also used to wrap the entire segment of the press overnight so that considerable heat would be retained for the next day's operations.

As the asbestos sheets used for preheating purposes were removed, a team of helpers placed the carbon enclosure around the area to be welded and then wrapped new asbestos sheeting around the upper part of the press. These jobs were accomplished as rapidly as possible in order to save the preheat. All doors and windows of the shop were closed so as to prevent drafts and sudden temperature changes that might affect the preheat.

In the hospital, the patient is completely covered with a sheet except for the small area to be operated upon. Much the same procedure was followed here. Welding was done through the small opening provided by tearing out a square of asbestos paper (Fig. 3).

Welding Procedure

A current source of 800 amp was provided by a hook-up of two 400-amp d-c motor-generator welders. The carbon electrodes were of $\frac{5}{8}$-in. diameter and used with straight polarity.

After striking the arc, Mr. Jardine commenced a circular puddling motion with the electrode, maintaining a long arc of about $1\frac{1}{2}$ in. between electrode tip and the molten pool. When the edges of the crack were almost dissolved, he stopped the arc momentarily while a helper standing close by (Fig. 4) dropped small pieces of cast-iron into corners and crannies of the carbon box as Mr. Jardine directed. Measuring about 2 in. long, $\frac{1}{2}$ in. wide and $\frac{1}{8}$ in. thick, these small pieces of iron were melted into the ever-increasing puddle. Care had to be taken that each new piece of filler metal was thoroughly dissolved and stirred into the molten puddle, not merely stacked in fused layers.

Care also had to be taken not to touch the electrode to the sides or bottom of the weld area since such contact might result in the addition of carbon to the chemical analysis. Though some carbon is inevitably transferred through the arc, not enough is deposited to make a hard weld, one difficult to machine.

Amidst constant puddling of the molten mixture, new filler metal was added until the break was filled. Because of the high heat of the arc and the fluidity of the weld zone, a "cast" structure was created about the weld area, a structure nearly identical with the parent metal.

After the broken and cracked brackets had been repaired, the other brackets were reinforced by building them up at certain stressed points. This work was also done with the carbon arc. Slow cooling after all welding and reinforcement work had been completed helped to insure machinable welds.

Including machining, the total down-time of the press was about three weeks. If a new press could have been obtained at all, replacement would have cost at least $6,000, the owners estimate. Repair by welding cost $300.

WELDING a butt joint with torch

TRACTOR CRANES lift a 90-ft length of pipe in position on concrete chairs

Gas-Welded Water M

"Fastest-growing" town in Australia, Whyalla gets its water supply from a pumping station 223 miles away. The water is carried above ground and flows in continuously welded pipe of varying diameters

BY HERBERT LEOPOLD
McGraw-Hill World News

IT is not difficult to see what made the Great Broken Hill Pty., Ltd., Australia's iron and steel monopoly, choose a sunbaked, waterless desert stretch along the coast of South Australia as a site. Proximity of the Big Iron Knob ore deposits was one reason. Another was that shipbuilding, one of the projected BHP activities, is an outdoor industry that needs sunshine more than rain.

Yet, by all rules of industrial location, the steel town of Whyalla was doomed to failure because an industry cannot be run without water, and Whyalla would not have been a famished ore railhead if plenty of water had been there. For years the meager supply of a 100,000-gallon reservoir was eked out with distilled sea water and fresh water brought across Spencer's Gulf in BHP barges.

Making the Desert Bloom

Fifty years ago an Irish engineer devised a plan to pump water through the bushland of Western Australia into the "golden mile" of Kalcoorlie, 350 miles from the source. A similar project was successfully carried out for the desert town of Whyalla, now reputed to be the "fastest-growing town" in Australia.

The pipe line's starting point is the south bend of the Murray river at Morgan, and it is designed to deliver annually 1,200,000,000 gallons of water to Whyalla, 223 miles away, in addition to 9,000,000,000 gallons taken off in between.

The water is carried by continuously welded pipe laid above ground. It varies in diameter from 30 in. at the intake to 21 in. at Whyalla. There are four major pumping stations and numerous storage reservoirs with a total capacity of 44,000,000 gallons. To build it all required 40,000 tons of steel and the placing of 75,000 cu yd of concrete.

Water is drawn from the Murray river at Morgan and pumped in four lifts to a height of 1,558 feet in storage tanks at Hanson, after which it flows by gravity.

The main is supported on concrete chairs placed fifteen feet apart. Alignment of the pipe is maintained by concrete thrust blocks, provided at every 270 feet on the straight and at all bends, and by heavy concrete anchor blocks spaced a mile apart. Numerous creeks and ravines necessitated the construction of a number of bridges and of many concrete piers. The spans vary in length from 30 to 140 ft. Over the Rocky river near Georgetown, two 140-ft steel trusses were required. An important labor-saving feature was the use of steel forms for the casting of concrete piers at creek crossings. These forms enabled duplicate piers to be cast as needed.

The most important of the four pumping stations is located at Morgan, where intake pipes are at all times below the level of the river. Pumps installed have a capacity of 4,500 gpm, which will be raised to 7,200 gpm by the installation of additional pumps. Power is provided by a 66,000-volt transmission line from Adelaide.

Choose Gas Welding

The South Australia Engineering & Water Supply Department, the planning, designing and construction authority, brought into the project the experiences gained in the construction of a continuously welded line laid with reconditioned single lock-bar pipes. To do this job, it had been necessary to flame-cut the ends from most of the pipes, and these cuts were also used to form bevels for butt welding. On the previous Tod river project, it had been found difficult to provide uniform clearance, particularly adjacent to the lock-bar. Oxyacetylene welding

GORGE CROSSING near Port Germein, South Australia. The welded main delivers 1,200,000,000 gallons annually

teMain

accordingly suggested itself as the most suitable process because of its greater adaptability to non-uniform clearances.

With trained personnel and ample equipment available from the Tod river project and satisfactory results already on record, oxyacetylene welding was given the preference on the new job.

Only one mile out of 223 was laid with arc-welded fillet welds on ball-and-socket joints. Careful costing of this mile indicated small savings in regard to the welding operations and the handling of the pipes.

According to data made available by the deputy engineer-in-chief of the Adelaide EWS Department (to whom credit is due also for other details of the project), semiautomatic butt welding completed 46.7 ft of seam per weldor per day as compared with 35 ft daily for manual welds. This performance is based on 24-in. ID pipes with a plate thickness of ¾ in. and 25½ in. OD. Seven joints per man were welded with semiautomatic equipment, while the average with the hand method was 5.25 joints per man. In addition to welding, operators were required to do a certain amount of lining up and preparation of joints, and there was also time lost in moving equipment from weld to weld.

The comparative costs per weld on the 24-in. ID pipe with ¾-in. wall thickness were $3.70 per joint and 55c per foot by the semiautomatic method; $4.97 and 75c per foot for hand welds. This calculation includes productive labor, machine line charges, materials, loss of time, overhead and all other charges.

Training Weldors

Welding operators were trained by the department after selection for physical fitness and intelligence. Following two to three weeks' practice on old discarded pipes under the supervision of experienced weldors and instruction in the maintenance of equipment, the trainees were put on the job as weldors' assistants. Within two to three months, they were classified as second-class weldors. Those whose progress continued to be satisfactory were made first-class weldors after 12 months. Proficiency was generally attained first in semiautomatic welding. The highest degree of skill was required for the fillet welds on ½-in. sleeves placed on the main at intervals for closure of the pipe line under mean-temperature conditions.

The practice adopted on welded steel mains in South Australia is to terminate the concrete lining about ½ in. from the end of the pipe and to fill the gap with cement mortar after the pipes have been joined by welding. No serious damage to the concrete lining has been noted, although the welding heat does tend to loosen the lining near the pipe joints.

Branches and other fittings were arc welded to the body of the pipe as far as possible in order to reduce the risk of damage to the lining. When the pipes have slip-in or bell and spigot joints, necessitating a fillet weld directly opposite the concrete lining, arc welding is preferable to oxyacetylene, according to the deputy engineer-in-chief.

In constructing this main, ten joints per mile were left for subsequent linking at the mean temperature of 65-70 F. By this means, compressive and tensile stresses in the steel were evenly balanced.

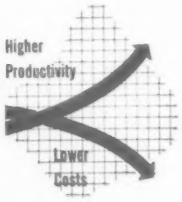
Troubles such as cracks and weld failure in welded mains laid by the department have usually occurred in sections which have been "linked in"; *i. e.*, the final closing joints were made at a fairly high temperature, resulting in excessive tension when the pipes are reduced to a low temperature during cold weather. On the whole, the deputy engineer-in-chief states, continuously welded steel mains have proved entirely satisfactory. Loss of water through leakage is negligible.

Welds Tested

Weldors were obliged to stamp a distinctive and identifying marking on the pipe near each weld. Tests were frequently made of the actual pipe welds, and test pieces 16 in. long and 2 in. wide were cut from the joints for this purpose. These were dispatched to Adelaide, machined to size and tested in a tensile testing machine. The results were tabulated and used as a check on the weldors' work. A small hydraulic testing machine was also used to carry out field tests on small test strips. The opening left by the removal of the test strip was covered by a welded plate.

1—UNDERSIDE of portable welded bridge. It allows even heavy trucks to cross the ditch dug for a 24-in. gas main in the Bronx

2—HAND-OPERATED overhead crane built by Slattery Construction from 6-in. piping



Cost Savers f

Welded devices reduce cost and speed work on the construction of a 24-in., 7½-mile gas main. Portable steel bridges were used to carry vehicular traffic over trenches. A welded crane positioned pipe

BY R. G. SWISHER

IN construction of a 24-in. all-welded gas main running 7½ miles from Hunt's Point in the Bronx to Mount Vernon, N. Y., The Slattery Construction Co. made use of several novel devices to speed up work.

The 24-in. steel pipe was laid in a 4-ft trench that ran all the way along city streets and so had to cross side streets every hundred yards or so. This meant that a bridge had to be built to carry the cross traffic every time the trench cut across a street.

Ordinary practice is to construct a wooden bridge of heavy planks. If the trench is very wide, the bridge is reinforced with braces from the bottom of the trench. This type of bridge takes considerable time to build, and it must be torn down every time it is moved.

To save all of this, Slattery designed and fabricated several portable steel bridges. The bridge used for foot traffic consists merely of a large plate of 1-in. mild steel with several holes at the edges to permit it to be lifted by means of sling and hooks.

The vehicle bridges were much more complicated. They were fabricated from 6 to 8 ft lengths of 6-in. I-beams, beveled at the ends and welded to three plates of ½-in. steel. The bevel presents a narrow face to the wheel of the oncoming car or truck. No bending was necessary as three pieces of steel plate were used; one piece on the flat and two narrow pieces for the beveled edges. Holes were provided at the edges for easy lifting. Underside of the bridge is pictured in Fig. 1.

This portable steel bridge offers several advantages over a wooden bridge. It can be placed in position and forgotten. It will carry any load that the road leading to it will carry. It won't shift nor slide under ordinary circumstances and so doesn't need to be anchored in place. Even though a crane is needed to move it, it takes far less time to erect than a wooden plank bridge.

A variation of this idea could be used for any number of purposes: prefabricated shorings, unloading stages, ramps, etc. Any variety of shapes and forms could be prepared at the yard to provide sturdy, movable supports and platforms that could be used to aid construction activities.

Overhead Hand Crane

Another cost-saving device used by Slattery is a portable overhead hand crane (Fig. 2). This consists of a large sawhorse affair made of sections of 6-in. pipe welded together and mounted to wheels. A chain block-and-tackle is hung from the center of the device to raise or lower the gas main as required.

The 40-ft lengths of gas pipe, weighing 2½ tons, are first laid in the ditch by means of a truck-mounted power crane (Fig. 3).

3—TRUCK-MOUNTED CRANE lowers a pipe section in place, after which the overhead hand crane takes over to raise or lower pipe to exact position

4—PIPE CLAMP holds ends of pipe in position for welding. A small space is left between the ends

for Pipe Line

Slings are then slipped under the pipe, and the portable hand crane, which straddles the trench, is rolled over the pipe. The hand crane is then used to raise or lower the pipe into exact position for welding.

The saving lies in the fact that the expensive operating truck crane is free after it has done the heavy work of moving the section of pipe into the ditch. It and its crew are not tied up while the pipe is being fitted into place and welded.

The truck crane can go on with other work while the hand cranes hold the pipe in place. Finally, it is a great deal easier to raise or lower the pipe a fraction of an inch with the hand crane than it is by means of the large power crane.

After the pipe was lined up, a cam-actuated alignment clamp was placed over the two edges of the adjoining lengths of pipe. The pipes were then clamped into position for welding, as shown in Fig. 4.

The ends of the 3/8-in. wall pipe were delivered from the factory beveled for welding. The plain end joints were bell-hole welded by two operators working simultaneously on both sides of the joints (Fig. 5), each welder coming down from the top. After a complete first bead had been laid, the second and third beads followed in the same manner. Approximate welding time on each joint was 1¼ hours, and approximately 5 lb of electrodes were consumed on each joint.

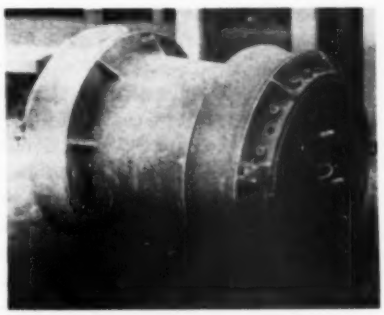
Pig for Air Testing

The welds were all tested at an air pressure of 150 psi by means of a pig (Fig. 6). This is a short section of pipe with two rubber flanges set a distance apart. An air line leads to the flanges and another air line to the space between them. When the flanges are inflated, the center section is sealed off, and air pressure is exerted against the weld joint.

The test is made by sliding the pig inside the pipe until it straddles the weld joint; that is, one rubber flange is on each side of the weld. The flanges are then inflated, which seals off the weld joint. Air is then pumped into the space between the flanges until a pressure of 150 psi is being exerted against the joint.

Photos courtesy The Hobart Brothers Co.

5—BELL-HOLE welding is done by two operators, who work on both sides of the joint simultaneously



6—PIG AIR TESTS welds. The two rubber flanges are inflated to seal off the joint while air is introduced into intervening space to 150 psi

Tips on Tip Care

This piece was written by a man who learned his facts the hard way by actually doing the job. It's right down your alley if you are a flame-cutting operator. If you're not, our advice is read it anyway

BY D. S. JONES

1—DRESSING with an auto point file keeps tip end square and flat

MANY shops and shipyards in which the hand cutting torch is used extensively offer little or no instruction on tip care and use, apparently taking it for granted that the flame-cutting operator has had such instruction previous to coming to work or will get same from fellow workers on the job. However, the majority of cutting operators didn't learn their trade in a trade school or from a competent instructor on a job, and many of those who did failed to get the proper instruction on tip care. Many cutters may work for months without receiving such instruction and are consequently handicapped by their inability to take proper care of their equipment.

Cleaning Torch Tips

Most excessive deposits of slag on hand torch work are caused by dirt in and on the tip, by insufficient lineal cutting speed or by a combination of both. Dirt is bound to occur on tips, especially on repair work where the cutter has to contend with paint, galvanizing, rust and scale in large quantities. Since the man using the torch cannot avoid the dirt, he should know the best way of getting rid of it after it gets on and in his tip.

The best method I have found is accomplished through the use of a small file and tip drills of the proper size. An automobile point file, which may be purchased for ten or fifteen cents at any auto supply house or hardware store, is easily broken to a convenient length for carrying with the drills in a tip tube or small box. The drills with handles attached may be purchased at any welding supply distributor. They are also available without individual handles but with an interchangeable holding chuck; these drills, however, are not so convenient as those with handles attached and are more easily lost. Drill sizes are designated by numbers. The proper drill size for any tip number and make should be known by the tool crib attendant, who receives the information from the oxyacetylene equipment distributor (see The Welding Engineer's Engineering Data Sheets Nos. 53 and 54, February and March, 1945).

The tip should be kept square and flat on the end by the use of the file (Fig. 1). Remove the scale and dirt just down to the copper at the beginning of each cleaning operation. Cleaning, incidentally, should take place whenever the tip becomes even slightly dirty, which is to say after almost every cut. After the tip end is dressed, the drills should be fed gently through the cutting and preheat orifices (Fig. 2). A very considerable amount of care is necessary as copper is soft and the slightest scratch on the inside of the oxygen orifice will throw the cutting jet out of symmetry and result in slag deposits and inaccurate cuts.

I have found that if the shank of a drill is roughened a bit near the handle, it makes an efficient and safe instrument for the removal of dirt and scale from the inner walls of the cutting and preheat passages. With experience, you should be able to feel any dirt in the tip through this roughened portion of the drill shank by moving the drill in and out of the tip and gently pressing the shank against the sides of the passage while so doing. Any dirt or scale that is in the passage can be felt through the slight drag and vibration it offers the drill. Continued gentle friction from the drill shank should remove the scale.

Don't Use Wires

There is no proper substitute for drills in tip cleaning. Never use stiff wire, ice picks, safety pins or ground welding rods unless you want to ruin good tips by swaging the orifices out into a funnel-like shape and/or by

2—TIP DRILLS clean the oxygen orifices for cutting and preheat

3—OXYGEN JET inspected for symmetry—first position of torch

4—INSPECTING flame and oxygen jet—second position, torch level

making cuts and scratches on the inner walls of the oxygen passage. Both of these injuries cause oxygen jet distortion, which in turn results in poor cuts.

When you think you have your tip clean, test it. This is done by simply lighting the torch, adjusting it to a neutral flame, pressing the oxygen trigger and inspecting the flame. If the tip is clean, the flame will extend a distance of about 2½ times the length of the tip before the oxygen trigger is pressed. The inner cones of the preheat flames will be of equal length and color, and, when the trigger is pressed, the oxygen jet will appear as a straight, pale blue shaft down the center of the flame envelope. The shape of the oxygen jet will be somewhat similar to that of a mechanical pencil lead protruding two or three inches beyond the end of the pencil. The jet should present this appearance when the flame is viewed with the torch held in each of two positions, about 90 deg apart.

To put it another way, first hold the torch in a vertical position in front of you (Fig. 3) with the tip at right angles to your line of vision. With the flame adjusted to neutral (feather edge just barely removed), press the oxygen trigger and view the oxygen jet. Then raise the torch handle upward and outward until the torch is level (as in Fig. 4) and inspect the jet again. If the jet shows much distortion at either position, there is dirt in the cutting orifice or the oxygen pressure is high—and probably too high.

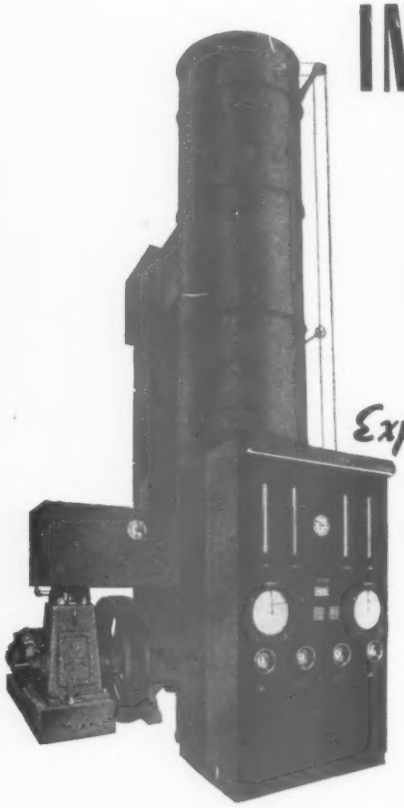
By keeping the outer surfaces of the head and tips of your torch reasonably free from smoke film and dirt, you will also keep the temperature of the torch down and thus prevent much backfiring and burning inside the tip. When the flame backfires and begins to burn inside the tip, there will be a warning whistle. When you hear that noise, immediately cut off the *oxygen* to prevent the tip from melting.

If you wish to do good work as a flame-cutting operator, you will do well to give considerable attention to the matter of your body position while working. Like a weldor, you cannot do good work if you are uncomfortable. Hence make every reasonable effort to assume a comfortable position—one in which you are not apt to get burnt—before starting a cut. I endeavor to brace myself at three or four points of my body. When I'm working at a table, I like to brace one or both knees, my hip and at least one elbow—both elbows if possible. On a large flat plate, I like to kneel on "all fours" at a 90-deg angle to my line of cut. In this position, it is a considerable help to have a thin cushion of some sort under each knee.

Proper Cutting Position

Whenever possible, you should assume a position at right angles to the line of cut and should move the torch from right to left, *rolling*, not sliding, your left hand beneath the torch. Make your cuts as long as possible without straining yourself or leaving the line; 6 to 10 in. in length should be about right. You will get into difficulties if you try to make an accurate cut by straddling the line of cut. First, you will have your hose and torch to fight as they drag over glove and floor or work, and visibility will also be impaired. The drag method looks easy to the beginner, but it is not half so easy in the long run nor nearly as accurate as the side-swing method.

You will find that your work will be better if you use as cool a flame and as small a tip as is compatible with the thickness of metal and the amount of work you are expected to do in a given length of time. Most cutting operators use tips that are



INDEPENDENT

Gas Producing

PLANTS

Expansion Engine Type —Medium Pressure

OXYGEN & NITROGEN

Producing Plants

Built in standard sizes as listed below in single and double rectification units. Streamlined panel provides quick visibility of all gauges. Compact design—requires minimum of floor space.

SIZES IN METERS AND CUBIC FEET

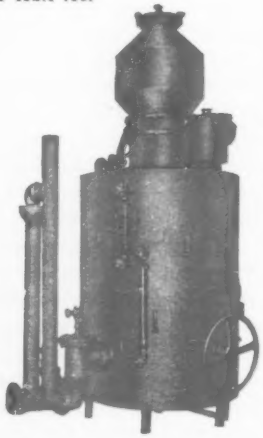
15 Meters or 530 cubic feet	75 Meters or 2650 cubic feet
30 Meters or 1060 cubic feet	100 Meters or 3530 cubic feet
40 Meters or 1412 cubic feet	150 Meters or 5300 cubic feet
55 Meters or 1940 cubic feet	200 Meters or 7060 cubic feet

Larger sizes also available

LOW PRESSURE

ACETYLENE GAS

PRODUCING PLANTS



This 600-lb. Acetylene generating Plant is one of the safest plants manufactured. Automatic controls minimize the operating personnel. Capacity 2700 cu. ft. per hour. Generator only is illustrated. Affiliate units are designed to insure maximum production at minimum costs. Complete details of construction and plant layout on request.

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INDEPENDENT ENGINEERING COMPANY, Inc.

Manufacturers of

CONSULTING · RESEARCH · DESIGNING

CYLINDERS AND GAS PRODUCING EQUIPMENT
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O'FALLON 5, ILLINOIS

too large, too much heat and too much gas pressure. For most shipyard plate-shop and on-the-boat work, pressures of 6 psi for acetylene and 30 to 35 psi for oxygen are enough.

When beveling anything over ½ in. thick, you will find that preheating gives a smoother, neater job, and the undercutting along the underside edge of the bevel can usually be corrected by the use of a bit more speed. Preheating also helps when you are cutting rounds or half-rounds.

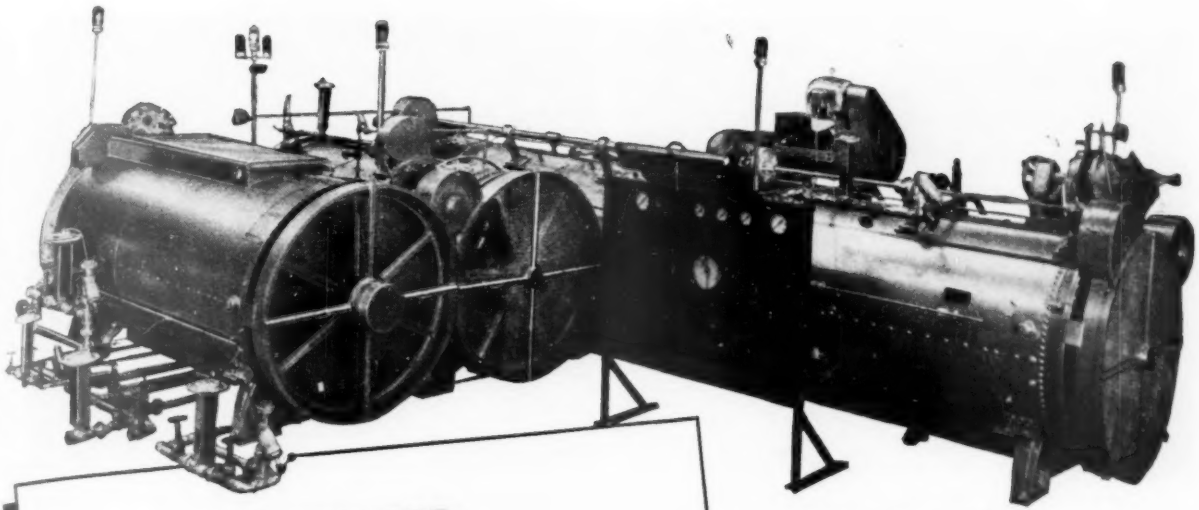
In cutting welds with the 45-deg flat tip, results will be much better if you clean the weld on both sides before you start the cut. The job will also go smoother if you remove welding "bugs" from the surface over which you intend to drag your tip and apply soapstone for lubrication. In cutting welds, a lot of heat may be used but not too much oxygen pressure. About 25 psi is usually plenty. The use of excessive pressure here is apt to result in digs into the parent metal.

The Line You Cut by

I find a distinct, narrow, single soapstone line or scribe mark best to cut by. The flame force is apt to blow chalk lines off the work an inch or so ahead of the kerf, thereby making really accurate cutting almost impossible. Punch marks are usually inaccurately placed and tend to interrupt the cut when they are deep. On painted, galvanized or very dirty or rusty metal they are necessary, but not on new, reasonably rust-free stock. In the latter case, they are not only unnecessary but are a definite nuisance.

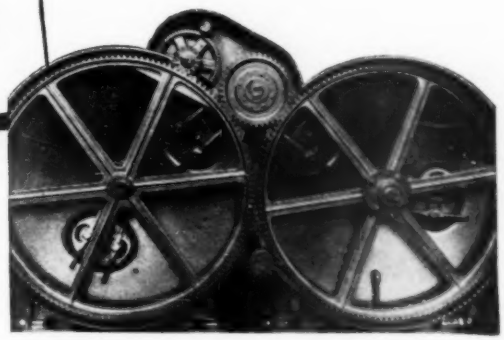
You have probably heard this before, but it will bear repeating: Petroleum lubricants should never be used on oxyacetylene equipment. Oil and oxygen under pressure form a violently combustible mixture which may ignite spontaneously. Especial care should be taken to keep your hands free of oil when changing oxygen cylinders.

Flame-cutting *is* important and worth a little effort to do well. A little care on your part will make the jobs of fitters and weldors much easier and thus help to effect an overall saving on the job cost. There ought to be considerable personal satisfaction in that.



Pressure cooker and cooler built by Anderson-Barngrover Division of Food Machinery and Chemical Corporation, San Jose, California.

BUILT FOR *Pressure Cooking* WITH HEAD-SHAPES 3/4" THICK



Lukens Flared, Dished and Flued Head-Shapes were used for the cooker and cooler ends.

Its ¾-inch ends dished inward and steel plate construction used throughout, this cooker is really built for high internal pressures. It is safe and dependable.

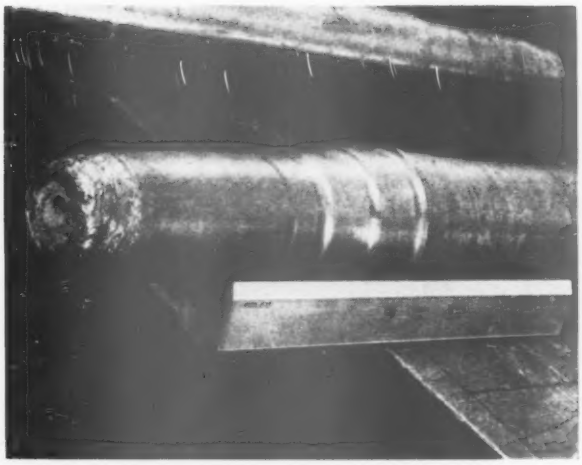
The use of Lukens Head-Shapes, of a special design, for these cookers and coolers, simplifies their fabrication. There are no forming operations required at the manufacturer's plant; these head-shapes are already dished, flared and flued. Lukens flattens the flange to close tolerances, so little metal has to be machined off.

Many other manufacturers have similarly found that it pays to employ Lukens Head-Shapes either of standard or special design. With the large number of standard styles and sizes available, designs are easily suited to their use. You pay less for standard shapes and the hundreds of dies on hand at Lukens speed up their delivery.

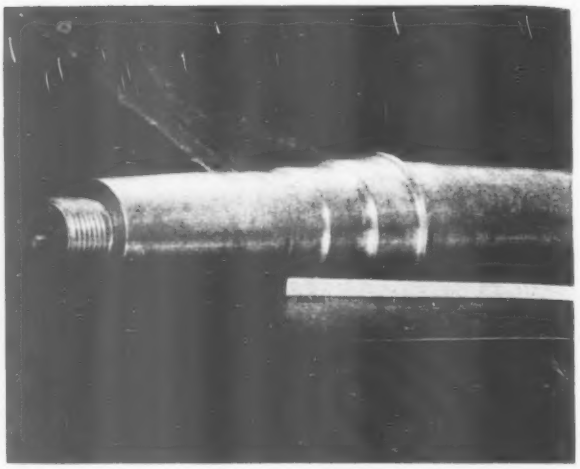
Whether you're building tanks, pressure vessels or other products, you should have Catalog No. 1, listing 3,989 standard Lukens Head-Shapes. For a copy, write Lukens Steel Company, 416 Lukens Bldg., Coatesville, Pa.

LUKENS HEADS

FOUR INCHES TO OVER TWENTY FEET IN DIAMETER



SPIRALLY PROGRESSING weld with E-6015 low-hydrogen electrodes builds up undersize shaft for turning



BUILD-UP after turning and threading. No distortion could be found in the welded section of above shaft

Improved "Putting-on" Tool

Low-hydrogen type electrodes, AWS E-6015, offer excellent possibilities when undersized parts have to be built up and then have threads turned on the deposited material. Preheating is required

BY E. F. DAVIS

Manufacturing Engineer, Headquarters Mfg. Eng. Dept., Westinghouse Electric Corp.

FOR building up surfaces which have been turned or bored in excess of allowed dimensions, arc welding has saved many parts from the scrap box; with better electrodes and procedures, it can save many more.

An improved electrode for difficult jobs, AWS E-6015 (low-hydrogen) offers great possibilities for this type of work. Those who have attempted to turn threads on a part which has been built up with ordinary E-6012 electrodes will appreciate the ease with which the E-6015 deposited material turns. There is no evidence of tearing at the peak of the thread, and machinability is excellent.

Reclaim Undersize Shafts

A number of shafts made from SAE 4130 were machined undersize on one end where it was necessary to turn a thread. The undersized shaft was approximately 2½ in. in diameter. The first step was to turn it approximately ⅛ in. smaller on the radius in order to lower the fusion zone below the pitch diameter of the threads.

Next, the journals and adjacent parts of the shaft were covered with asbestos secured with tape. The shaft was then placed on end, in position for welding, and preheated to 450-500 F. The heating was performed with an oxyacetylene torch and was done slowly enough to allow some heat to be conducted into the body of the shaft. Temperature-indicating crayons were used to check temperatures as too steep a temperature gradient would not be desirable.

The welding was done with 5/32-in. electrodes using a current of approximately 150 amp, d-c reverse polarity. The weld progressed spirally around the part, and the first layer was completed to the top before another was started. Care had to be exercised so that the heat did not exceed the preheat temperature by too much. (If a pass holds a high red heat for two inches or more, the joint is too hot.)

Given Slow Cooling

The welded section was covered with asbestos and allowed to slow cool. No additional treatment was given to the part after welding. The old centers served for checking distortion (of which none was evident) and for turning and threading the welded section.

The 450-500 F preheat was necessary because of the hardening characteristics of SAE 4130 steel. Straight-carbon steel such as 1045 would require only 200-250 F, which would be sufficient preheat to slow the quench rate in the heat-affected zone.

Weld Aluminum with a "HELIARC" Torch and Cut Cleaning Costs

Trade-Mark

This manufacturer of aluminum truck bodies cut his cleaning costs to the bone by changing to the HELIARC welding process. With HELIARC welding he gets clean, sound welds with no spatter and without using flux. The net result of eliminating the cleaning of flux and spatter metal is a large saving in time, money, and materials.

You can get these savings too. Use the HELIARC process to weld aluminum, magnesium, Monel, and Everdur. No flux is used for any of these metals. HELIARC welds are so smooth and clean that many articles need no finishing. If the article is to be finished so that the welds do not show, it takes only a light grinding to remove the smooth, even ripple and produce a flush surface.

Get more information on the inert gas shielded arc welding process. LINDE's free booklets, on HELIARC welding show equipment, techniques and applications. Just mail in the coupon and we will send you this free helpful information.

"Heliarc" and "Linde" are registered trade-marks of The Linde Air Products Company.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation UCC

30 East 42nd Street, New York 17, N. Y.

In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

You can see the HELIARC process in operation at our booth in the National Metals Exposition—October 17-21, Cleveland, Ohio, or call any LINDE office for additional information on this process

THE LINDE AIR PRODUCTS COMPANY
30 East 42nd Street, Room 1402
New York 17, N. Y.

Gentlemen: Please send me more information about HELIARC Welding.

Name.....Position.....

Company.....

City.....State.....

on the job

Courtesy Air Reduction Sales Co.

QUARTET OF GEAR BLANKS are flame-cut electronically by shape-cutting machine at Brace-Muller-Huntley, Syracuse, N. Y., warehouse

Courtesy Chicago Bridge & Iron Co.

AN INSIDE JOB! This welder installs stainless-steel wear plates on the inside of an 8-ft diameter by 35-ft high petroleum refinery tower

Warehouse Cutting Service

AN INDUSTRY within an industry, steel warehouses (of which there are more than 1,200) maintain a stock of between 5,000 and 7,500 shapes, kinds and sizes of steel, often involving an inventory as high as 20,000 tons. Even so, there are customers who ask for special shapes and sizes.

Brace-Muller-Huntley, Inc., steel distributor of Syracuse, N. Y., is meeting such requests with a pantograph-type of shape-cutting machine equipped with four torches and an electronic tracing device. This machine will cut plate into circles, squares or irregular shapes on a fast production basis, and it enables the warehouse to offer a one-day service on most cutting jobs, whether ordinary or intricate.

* * *

Automatic Hard-Facing

By H. W. Sharp

WITH the development of continuous high-alloy wires, the field of automatic welding has been enlarged to include hard-facing. The automatic application is readily adapted to practically any equipment or parts on which hard-facing may be laid in a series of continuous stringer beads. Automatic hard-facing wires are produced on special machines which form a continuous tube from mild-steel strip; the granular or powdered alloying ingredients are added as the strip is being formed. Most automatic electric heads now on the market will handle the tubular hard-facing wires or can be adapted to them by minor changes in the feed mechanism.

Most of the hard-facing alloys now available as manual electrodes can be made for automatic application. One group of hard-facing wires is made with alloy contents varying between 5 and 10%. These materials have hardness values ranging from 35 to 55 Rockwell C. Deposits possess good abrasion resistance in combination with impact strength. Another group of hard-facing wires ranges from 10% to 35% in alloy content. This group of materials can be made with a high carbon content to provide excellent resistance to abrasion or with alloys which impart heat and corrosion resistance. Tungsten carbide tube-type material is also available for automatic application to parts subject to severe earth abrasion.

Courtesy Steody Co.

TRACTOR ROLLERS and idlers hard-faced by automatic process. Note smooth surfaces

Courtesy The Taylor-Winfield Corp.

"GUTHLITE," a hinged fluorescent fixture, is made by spot welding sheet-steel members

A growing number of privately owned job shops have set up automatic equipment for maintenance of construction machinery. In the western states alone, there are now some twenty job shops able to handle the rebuilding of worn heavy equipment.

The rebuilding of tractor rollers, manually welded for many years, was the first job shop work performed with automatic hard-facing. Rollers are of such size and shape that they are easily handled for automatic rebuilding. Tractor rollers are rebuilt to full size for usually one half the cost of replacement parts. The life of rebuilt rollers has been two to four times the life of factory replacement parts. Furthermore, the hard-faced rollers definitely cause less wear on track rails.

The accompanying picture shows a set of rollers and idlers ready for re-assembly on the tractor. The surfaces of these parts are sufficiently smooth in the as-welded condition to be entirely suitable. The welding time varies from 30 minutes to one hour each, depending upon the extent of wear. The usual amount of alloy material is 4 to 6 lb per roller and is laid in two or three passes to bring the part up to size.

* *

Spot-Welded Light Fixture

EDWIN F. Guth Co., St. Louis, has been using spot welders since 1910 in the manufacture of lighting fixtures. One of this company's latest products is a fluorescent fixture hinged at one end so that it can be pulled down for replacement of starters or tubes, avoiding the necessity of yelling for a step ladder.

Accompanying picture shows the ends and channels being spot welded together. Both are of 20-gauge steel. A spot welder is also used to produce a 20-gauge aluminum ornament on the fixtures.

Courtesy The Linde Air Products Co.

WORLD'S LARGEST size torch cuts a 2-ft ingot at Colorado Fuel and Iron Corp.

Mechanized Scrap Cutting

A CUTTING torch said to be the largest size in the world has been put to work cutting up scrap at the Colorado Fuel and Iron Corp., Pueblo, Colo. This torch is mounted on a turntable unit and traversing carriage and is thus accessible to work in a wide area. A counterweight provides for easy raising and lowering.

In the accompanying picture, the torch is cutting lengthwise through an ingot 2 ft thick at a rate of 3 in. per minute. Its primary function, however, will be to cut up buttons and skulls. Heretofore, large buttons could not be reclaimed economically as scrap for use in the open-hearth furnace.

Continuous cuts through steel 68 in. thick have been made at Pueblo. Using the powder-cutting process, the torch is particularly well suited to cutting scrap having more than a normal amount of cinder and slag inclusions since the refractory oxides are removed continuously by a melting and fluxing action as the cutting proceeds.

In the powder-cutting process, an iron-rich powder is blown into the oxygen stream and heated to ignition temperature by the oxyacetylene preheat flame.

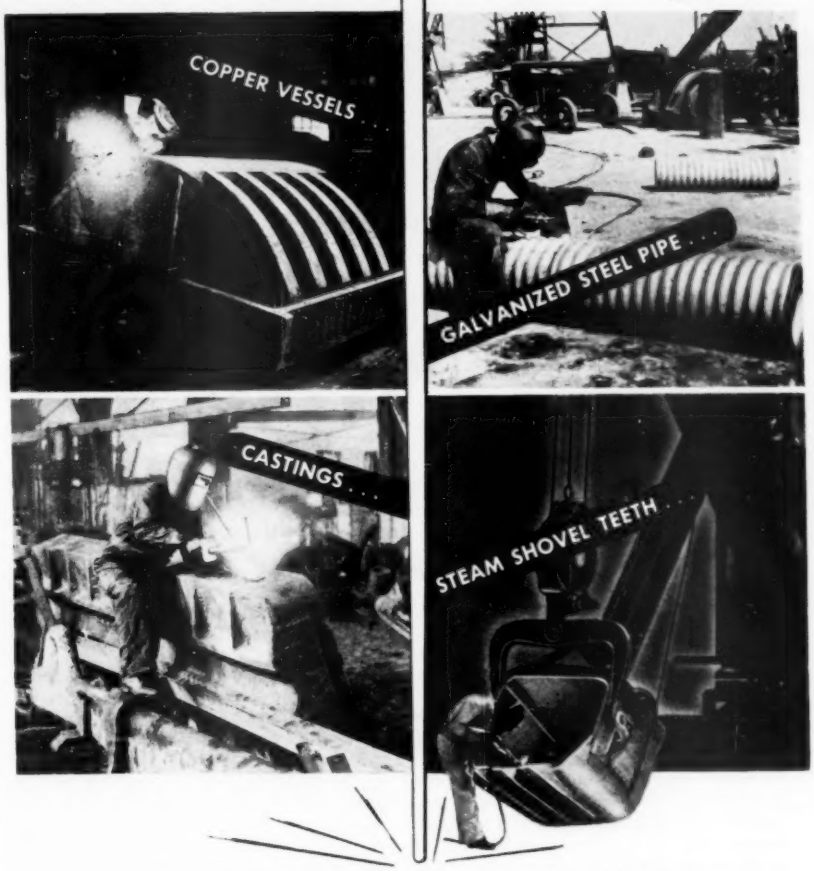
* * *

Novel Use for Flame-Cleaning

SURFACE clogging of the air diffuser plates used in sewage disposal units has always been a problem. Fine sand particles get in the plates and decrease or stop air flow. The usual cleaning methods are costly and unsatisfactory. Sandblasting, for example, takes three men about a week to clean the plates of only one unit. But the same number of men can do the job in six hours with flame-cleaning.

The heating head is a 12-in. multiflame torch. When used for most jobs of descaling steel or of preparing steel surfaces for painting, flame-cleaning equipment is hand-operated. For cleaning the diffuser plates, however, the torch head is mounted on a portable motor-driven carriage that enables it to be swept rapidly across the clogged surfaces.

in all cases



Speer Carbon Electrodes Give Stronger Welds at Low Cost!

Day after day, carbon arc welding proves itself in dozens of uses by giving hard, strong welds at low cost.

Speer Carbon Electrodes put top efficiency and economy into this versatile method. Greater current carrying capacity — even burning arc with high heat value — 33% longer life — 22% harder, are characteristics that combine to give you 13% more weld inches per electrode.

Get the economy and high efficiency that go with uniformly dense Speer Electrodes. Into the making of each one goes technical knowledge that has made Speer a leader in the welding field for 50 years.

Speer
CARBON COMPANY
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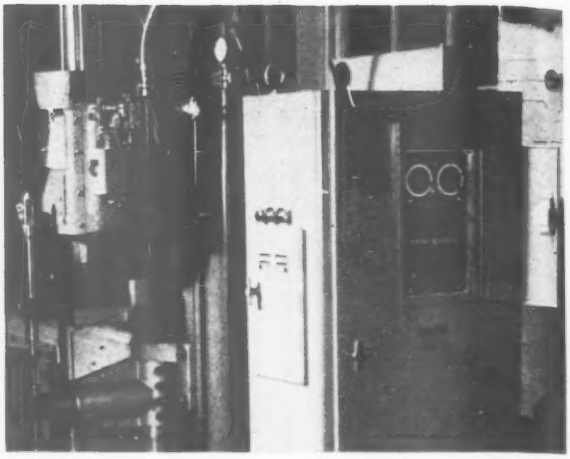
brushes · contacts · welding electrodes · graphite anodes · rheostat discs · packing rings · carbon parts

CHICAGO · CLEVELAND · DETROIT · MILWAUKEE · NEW YORK · PITTSBURGH

COTTON-FIBRE sheets filled with abrasive grain form wheels for grinding stainless welds. Cut-off wheels for non-metals, etc., also made



TIP PICK-UP in spot welding of aluminum, non-ferrous metals, reduced with new R-W slope control. Also said to minimize expulsion

New products f

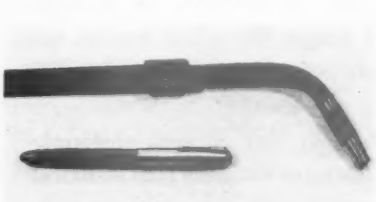
A flexible grinding wheel for stainless welds, a miniature inert-arc holder with a flexible tip and a new R-W slope control head the list of new products to raise production and lower costs

Weld Grinding Wheel

"FIBREX Red Wheels" for grinding welds on stainless steel, structural work and fabricated parts are manufactured from laminated sheets of cotton fibre filled with abrasive grain. Slightly flexible, the new grinding wheel allows some side pressure without risk of breakage and is said to not fray or tear out at the edge.

These wheels are offered in 7 and 9 in. depressed center types for disc sanders and right-angle grinders and in straight wheels in 6, 8, 10 and 12 in. by ⅛ in. thickness. They are claimed to cut a variety of non-metals including Transite, Celotex, BX Cable, Masonite, plastics and asbestos. (See picture above.) SIMONDS ABRASIVE Co., Tacony and Fraley Sts., Philadelphia 37.

* * *



"GOOSE-NECK" front assembly of small inert-arc holder may be bent to shape

Small Inert-Arc Holder

DESIGNED for the fluxless welding of non-ferrous metals in the thinner gages from 16 to 40, a new miniature inert-arc electrode holder has a continuous rating of 40 amp. Currents as high as 60 amp can be used on low duty cycles.

Featured is a flexible front-end assembly made of malleable copper tubing surrounded by a sheath of silicone rubber which can be bent for hard-to-reach places. Two models, one for 0.01 and 0.02 tungsten electrodes, and one for 0.04 and 1/16 in. tungsten electrodes, are available.

Applications are expected in manufacture and repair of surgical instruments, cutlery, business machines, metal novelties, control equipment, etc. The ability to weld easily-formed thin sheet metals will allow their substitution for fiber and cardboard in making mock-ups of projects, manufacture of containers, metal advertising novelties, strong front construction, etc.

Small quantity or pilot runs of products can be produced more economically with this torch, G-E engineers claim, than by resistance welding equipment needed for large quantity production. WELDING DIVISIONS, GENERAL ELECTRIC Co., Schenectady 5, N. Y.

* * *

Pardon, Please

The six new inert-arc electrode holders announced in the July issue of THE WELDING ENGINEER on page 55, are products of the General Electric Co., Schenectady, N. Y. Through an oversight the company name did not appear with the original announcement of the holders.

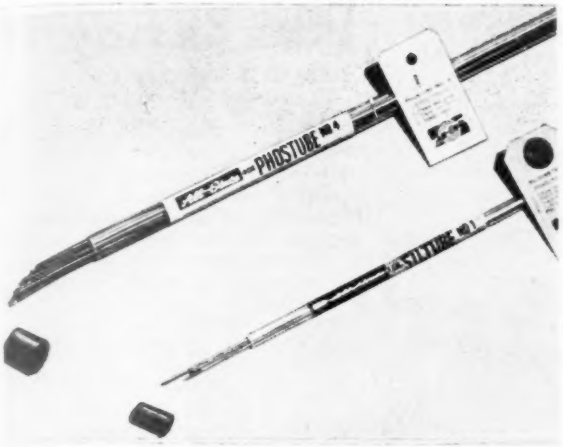
* * *

R-W Slope Control

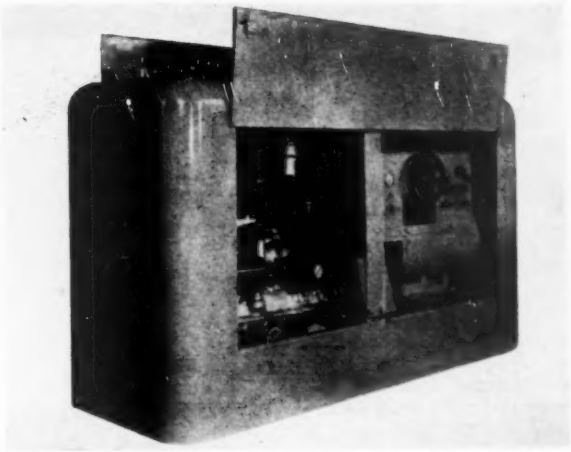
MATERIAL reduction in tip pick-up in the spot welding of aluminum, magnesium, etc., is said to be achieved with the new G-E slope control, adaptable to either synchronous or non-synchronous resistance-welding machines. This control is designed to provide a gradual increase in welding current at the beginning of the weld. Since it minimizes expulsion, its use is said to be desirable in the welding of heavy gauge steel and in projection welding. (See picture above.)

The new accessory control is furnished in two types: one intended for mounting in the side of synchronous controls, the other (in a separate enclosure) for use with older types of control and non-synchronous control. The operator's panel consists of two dials and a transfer switch. The setting of one dial, which is graduated from 3 to 13 cycles in one-cycle steps, determines the time for the welding current to reach a final value from its initially low one. The other dial, graduated in percentage of the final current, permits adjustment of the initial value of the welding current. The transfer switch facilitates disconnecting of the slope control for operations in which it is not needed.

In operation, the slope control functions as a variable resistor placed in series with the heat control rheostat in the standard welding control panel. The value of this "resistor" varies with time. At the beginning of "weld time," a control relay in the slope control is energized. Operation of this relay starts an electronic timing circuit that causes the "resistor" to vary in value. By this means, the phase



SEMI-RIGID plastic containers help merchandise All-State silver solder and brazing rod. Container identifies rod and keeps it clean



HEAVY-DUTY d-c arc welder comes in 300 and 400 amp sizes. Self-excitation of generator and simplified current control are featured

ts for welding

of the heat control in the main panel is gradually advanced. Consequently, the welding current is increased gradually from the initial selected value to the final value set on the heat control dial. GENERAL ELECTRIC Co., Control Divisions, Schenectady 5, N. Y.

* * *

Solder Packages

SILVER solder and phosphor-copper brazing rod are now being packaged in small, transparent, semi-rigid plastic containers by ALL-STATE WELDING ALLOYS CO., INC., 373 Ferris Ave., White Plains, N. Y. The distributor gains advantages in the new products display qualities and in ease of handling packaged wares. The repairman can carry such packages in his kit safe from loss, wrong use and contaminating grease and dirt.

All-State alloys available in this new package are: silver brazing rod in "Siltube" No. 1 and phosphor-copper brazing rod in "Phostube" No. 4. (See picture above.)

* * *

Dust Collector

SIMPLE installation is claimed for the Hammond "Duskolector", with only one electrical connection necessary. Flexible metal piping connects the collector with the grinder.

In operation, the dust-laden air is drawn from the grinder wheel hood through the air expansion chamber at the bottom of the cabinet. The heavier particles drop into the dust pan while the finer particles are removed by a set of three fiber glass filters. Since the air is drawn from the grinder and recirculated in the room, no heat loss is involved as with outside exhaust systems. Three sizes of this collector are available, in 330, 700 and 1,000 cfm capacities. HAMMOND MACHINERY BUILDERS, INC., 1648 Douglas Ave., Kalamazoo 54, Mich.

* * *

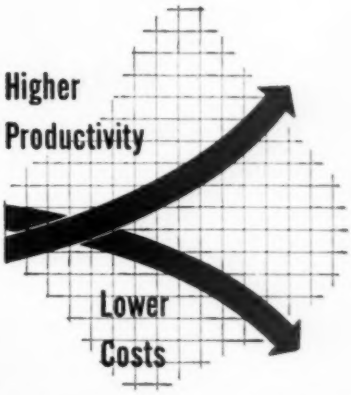
MELTING of carbon in veins of cast iron claimed for new "Bronzeweld" brazing flux

Cast Iron Flux

NEW brazing flux called "Bronzeweld" for cast iron repairs is claimed to dissolve some of the graphite carbon in the veins of the cast iron break so that the melted bronze flows into many tiny crevices for better holding action. The maker claims that this flux can be used for the tinning operation only, for economy, after which the regular flux can be used to finish the brazing.

The flux is also said not to blow off the filler rod or work no matter how strong a flame is used. This feature saves rod, welding gas, working time and the flux itself.

A steel brazing flux also under the Alfco "Bronzeweld" name is available from the same manufacturer. ALFCO LABORATORIES, 2415 West Belmont Ave., Chicago 18.



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Engine-Driven Arc Welder

SIMPLIFIED control of current output is achieved on the new Wilson 36A "Yellow Jacket" heavy duty d-c arc welder by a sturdy hand-wheel mounted on the control cabinet. Close calibration of the current dial eliminates the need for meters.

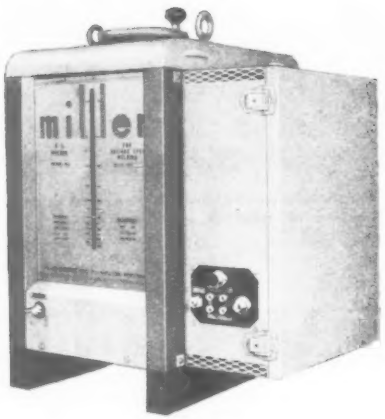
Built in 300 and 400 amp sizes, the welder is suitable for pipe lines, structural and heavy industrial work. The welding terminals are spaced to prevent accidental shorting between the lugs of the welding cables. For fast recovery voltage over short circuit, the generator is self-excited with excitation of the main field obtained through an auxilary brush.

The "Yellow Jacket" is a complete two-bearing unit, engine-driven by sheaves and steel-cored V-belts. The belt drive is said to reduce vibration problems in the field by compensating for slight misalignments.

Available in both stationary and portable models, the 36A is 76 in. long, 28 in. wide and 49 in. high. Optional equipment includes either a two- or four-wheel, high speed, spring mounted trailer equipped with pneumatic tires. (See picture above.) AIR REDUCTION SALES CO., 60 East 42nd St., New York City 17.

(*Continued on page* 54)

for "HELIARC"
spot
welding



miller

presents the compact, new Model 264-T—especially designed for "Heliarc" spot welding. The arc welder features continuous current control—adjustment to the fraction of an ampere. Power Factor Correction is available as optional equipment. Miller High Frequency is built in. The Miller Pneumatic Timer is assembled as part of the unit. This consists of the pneumatic timer, solenoid gas valve and flow meter. The Miller pneumatic timer has the accuracy of electronics yet is simple and requires very little service. For "Heliarc" spot welding, here is the complete package. See your nearest Miller distributor or write for his name and address.

THE WORD "HELIARC" IS A TRADE MARK OF THE LINDE AIR PRODUCTS COMPANY

ARC miller WELDERS

miller ELECTRIC MANUFACTURING COMPANY
APPLETON, WISCONSIN

30 YEARS AGO

(From THE WELDING ENGINEER of September, 1919)

REMOVAL of high insurance rates in the New England states on buildings where acetylene generators are installed was effective Sept. 1. It was largely through the continuing efforts of the International Acetylene Association that this change was brought about. All manufacturers of generators are advised, however, to see that the installation of all such generators is in strict conformity with National Board of Fire Underwriters rules.

— 30 YEARS AGO —

FLAME cutting processes vastly aided the war effort, says R. R. Browning, vice-president of Oxweld Acetylene Co. The demand for scrap steel was in part answered by use of this process in small towns or inaccessible locations throughout the country. In shipbuilding, the cutting torch was utilized for shape-cutting parts, cutting man holes, port holes, patches, mast openings and headlights. Scrap armor plate by the thousands of tons was cut by the oxyacetylene blowpipe. Plate averaging 16 to 17 in. thick was cut at $.013 per sq. in. and at a speed of 3 ipm. Another vital use was in the cutting of billets in the manufacture of artillery shell cases. Perhaps the most unusual use of flame cutting was to sever steel lakes steamers into two sections so that they could go down the Welland Canal. After being joined again, they aided in carrying troops across the Atlantic to France.

— 30 YEARS AGO —

PROFESSOR Alfred S. Kinsey is the author of a paper in THE WELDING ENGINEER this month which gives a technical evaluation of oxyacetylene welding. Before autogeneous welding, the engineer had to depend on forge welding which failed in many critical cases. Entrapment of sulfur, cinders and excess oxygen was commonplace in the old forge welds, he recalls.

— 30 YEARS AGO —

OXYACETYLENE welding schools in the Army Motor Transport Corps during the war are described in this issue by C. K. Bryce, formerly a Major in the MTC. Length of course was six to eight weeks, including 60 hours of shop work.

— 30 YEARS AGO —

A RECORD for the rapid cutting of steel is claimed by employees of the Edwin Forrest Forge Co., East Oakland, Calif. Walter Scharnitz made a 23-in. deep cut on a large crank shaft in eight minutes.

— 30 YEARS AGO —

ECONOMIES in the oxyacetylene welding of spring bands have been achieved by the Atlantic Coast Line Railroad. The bands are formed and welded with a vee-joint at one of the small sides. Average cost is 30 cents each, compared to a cost of 57 cents with the forge welding process.

For longer service at lower cost

...use Ampco-Weld repairs

instead of replacement parts...

Ampco-Trode 10 Saved this Costly Cast-Iron Gear-Box from the Scrap Heap

Ampco-Trode 10 produces dense, ductile welds in cast iron with a well-brazed bond and low base-metal dilution. Ampco-Trode's ability to weld cast-iron saved the cost of an expensive replacement when this complicated cast-iron gear-box broke into two pieces. Low-cost weld repair with Ampco-Trode 10 put it back in shape for extra years of service. *(Report from Montreal Welding Co., Montreal, Canada.)*

Ampco-Trode 300 Overlays Outlast Chrome Plate 4 to 1 on Draw Punches and Rings

Draw dies fabricated and/or rebuilt with Ampco-Trode 300 last 4 times as long! This more than offsets the lower initial cost of chrome plating. In addition, press-room efficiency gains nearly 15% by eliminating down-time formerly required to hone and polish dies in the middle of production runs! *(Report from Industrial Stamping and Mfg. Co., Detroit, Mich.)*

Phos-Trode Overlays Save nearly $4000 on a Single Turbine Repair Job

More than 20 years of cavitation and pitting had nearly destroyed the vanes and buckets on these 4-ton runners of a water turbine. Replacement would have cost more than $6000 — and there was a chance the original patterns were no longer available. The unit was completely rebuilt with Phos-Trode — restored to original contour — for 1/20th the cost of a replacement unit! *(Report from Montana Power Co., Great Falls, Montana.)*

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Milwaukee 4, Wis.

West of the Rockies it's the Ampco Burbank Plant Burbank, Calif.

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Send complete information on Ampco-Trode, Phos-Trode, and other Ampco arc-welding electrodes.

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Company.....

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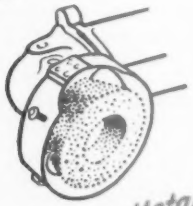
City.....(.....) **State**.....

Power
to Save Time and Muscle Before and After Welding

Sands any Surface



Grinds any Metal

Speeds Wire Brushing

Van Dorn Portable Electric Sanders are packed with power to speed up a variety of welding jobs. You can quickly prepare the surface to be welded by using Van Dorn Sanders with abrasive discs and "Whirlwind"* Wire Cup Brushes to remove rust, scale, oxidation and old paint. With saucer grinding wheels, they do a fast job of "V-ing out" the joint to be welded. After the weld has been made, use Van Dorn Sanders with saucer grinding wheels for swift removal of excess metal—and with abrasive discs for a satin-smooth finish.

Ask your nearby Van Dorn Distributor for complete information on these versatile tools and for help on any tooling problem. For your free copy of our complete catalog, write to: The Van Dorn Electric Tool Co., 734 Joppa Road, Towson 4, Maryland.

*Trade Mark Reg. U. S. Pat. Off.

FOR POWER SPECIFY

"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS

NEW PRODUCTS

(*Continued from page 47*)

"FLEETWELDER 200" has patented reactor control, no moving coils in the windings

A-C Welder

CALLED the "Fleetwelder 200" a new Lincoln 200-amp industrial-type welder has reserve capacity over its rated maximum of 250 amp. A Lincoln "arc booster" attachment is claimed to simplify low-current welding of thin sheets. The booster allows the welder to start the arc automatically when the electrode touches the work, because of an extra surge of current which lasts only a few seconds.

Adjustment of the current is by the control handle on the front of the case, which is only 25 in. high. Dial on top of case indicates current setting. Because of its electrical design, the open-circuit voltage is lower than usual, saving power consumption, operating costs and increasing safety. Electrode capacity is 5/64 to ¼ in.

There are no moving coils or leads in the windings. The patented reactor control eliminates dead air space. Heavy copper windings are insulated with spun glass and mica separators, placed in a welded steel laminated frame. THE LINCOLN ELECTRIC CO., Cleveland 1, O.

* * *

3B Weld Timer

FASTER consistent operation and more accurate sequence timing for non-synchronous resistance welders is claimed for a newly designed Westinghouse NEMA 3B weld-timer. It also provides easy low range adjustment.

The timer is enclosed in a wall-mounted sheet steel enclosure. The interior or control panel, with plug-in subassembly construction, is arranged to swing out in a horizontal plane to permit easy servicing. Time setting dials are arranged for easy time selection.

This timer is designed for operations up to 450 spots per minute on 20 gauge steel. WESTINGHOUSE ELECTRIC CORP., P.O. Box 868, Pittsburgh 30.

KEEP YOUR WELDING COT

under your thumb

with BURDOX

use this single Source Of Supply to save yourself TIME and MONEY

● You keep your welding costs "in line" when you use BURDOX equipment because *only BURDOX* gives you these 3 savings; (1) BURDOX quality welding equipment at lowest possible prices, (2) Better production at lower costs through the latest improvements, (3) Combined savings in time, record-keeping and delivery by securing from one source an engineered line of products to meet *all* your needs. You'll be surprised how quickly these savings will turn costs into profits. BURDOX products are handled by leading welding distributors...so on your next order start saving by calling for BURDOX. The new 68 page BURDOX Catalog...free to you...is the first step to lower welding costs...write for it today!

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Compton, Calif.
Please send me full details on the Contour Marker.
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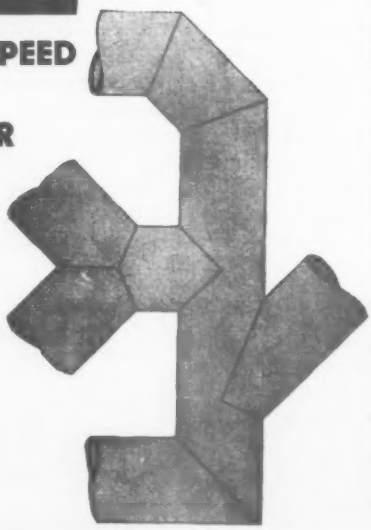
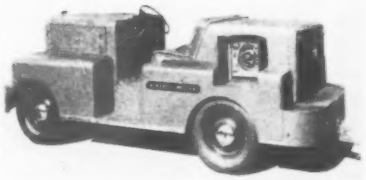




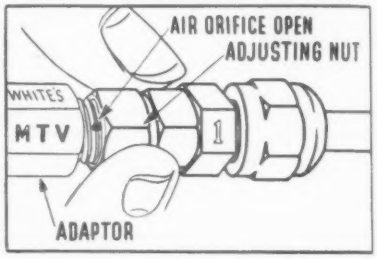
"WELDMOBILES" have built-in 300 and 400 amp welders. Gas equipment also carried

Self-Propelled Arc Welder

NEW models of the Hobart "Weldmobile" are in production. The GR-301-M has a 300 amp welder built in for light and heavy duty welding. Model GR-401-M has a 400 amp welder. Either unit can be furnished with 1 or 3 kilowatt auxiliary d-c power for supplying lights and small power tools.

The "Weldmobile" is equipped to roll to the job under its own power and make repairs with arc welding, oxyacetylene welding and cutting and power tool equipment. A universal coupler is provided at the rear of the rig to permit towing of additional equipment such as trailer-mounted welders, air compressors, etc. HOBART BROTHERS CO., Troy, O.

* * *



ORIFICE in side of new welding tip lets in cooling air for lower temperature flame

Adjustable Welding Tip

A SIDE orifice and adjusting nut on the new White MTV tip introduce a controllable volume of air into the oxyacetylene mixture for a cooler burning flame, the maker claims. This cooler flame allows consistent high-quality welds on aluminum, magnesium and white metal, it is said. The tip is also useful for silver soldering, brazing, lead burning and radiator welding.

Adaptors for these tips to fit any standard make torch are available from the manufacturer. Tips sizes run from No. 1 (51 drill) to No. 5 (3/16 in. drill). L. B. WHITE CO., 422 North 10th St., La Crosse, Wis.

* * *

A-C/D-C Electrode

A CORROSION-resistant weld deposit with a tensile strength of 110-120,000 psi is claimed for the new All-State No. 299 a-c/d-c electrode. The makers recommend this new electrode for welding vanadium-moly spring steels, nickel-clad steel, medium-carbon steel and air-hardening steels. A preheat of 300 to 500 F for the base metal is suggested. Deposited metal cannot be heat-treated. ALL-STATE WELDING ALLOYS CO., INC., White Plaines, N. Y.

PAGE WELDING ELECTRODES AND GAS WELDING RODS

WELDING STAINLESS?

○

TO RESIST WHAT?

HEAT?

COLD?

IMPACT?

BENDING FATIGUE?

CORROSION?

WHAT KIND OF CORROSION?

○

NOW ONE MORE QUESTION:

Are you using the best electrode or rod for your purpose?

If you're not too sure, get in touch with your PAGE distributor. Either he knows or he can find out from the PAGE Field Service Man. And the PAGE distributor has a wide selection of Page-Allegheny Stainless Steel rods and electrodes, so that he can give you the one that will serve you best.

ACCO

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PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

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NEXT BEST THING TO YOUR EYES IS "eyegard"

In coverspecs or regular models. For chippers and grinders as well as welders.

Eyegard "Champions" have 10-way Ventilation

Give your men the finest in comfort and protection—Eyegard "Champions"! They're the goggles that provide greater comfort because the lightweight plastic frame is molded to form-fit the face . . . greater protection because the goggles are impact-resisting . . . greater ventilation through three large vents at side of cup and seven additional vents around the lenses. Cool and fog-free. With all their exclusive features, they cost no more than ordinary goggles. Get Eyegard "Champions" on your next order.

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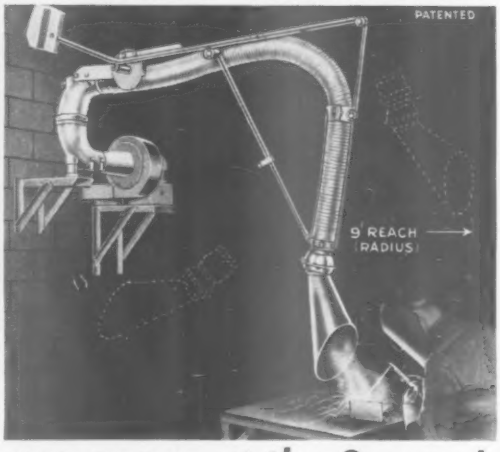
RUEMELIN Fume Collector

(Above) Welding without ventilating snout. Note smoke clouds and poor vision. Gases and heat surround operator's helmet.

(Right) Collecting fumes with a Ruemelin Fume Collector.



REMOVES WELDING FUMES *at the Source!*

Solve your welding fume problem efficiently by installing Ruemelin Welding Fume Collectors. They produce a powerful suction that removes smoke, gas and heat at the source. Guards employee health, resulting in less welder fatigue. Clears shop air with minimum heat loss. Covers maximum welding area vertically, horizontally and by circle swing. Made in 9 ft. and 15 ft. reach sizes. Shipped assembled, easy to install. Thousands in practical service. Free engineering service for your installation.

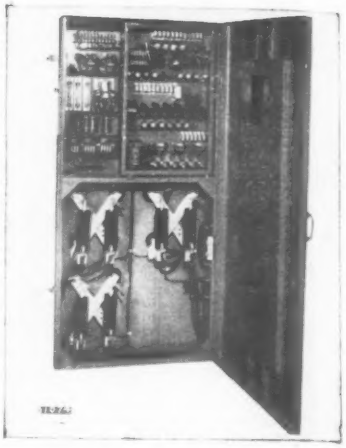
Write for our New Bulletin 37-D and list of users — just off the press.

RUEMELIN MFG. CO.

MANUFACTURERS AND ENGINEERS

SAND BLAST AND DUST COLLECTING EQUIPMENT

3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.



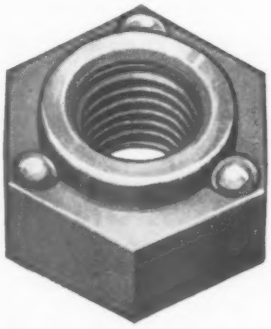
THREE-PHASE low-frequency welding control smooths flow of heat through electrodes

R-W Control

HIGH power factor characteristic in a new three-phase low-frequency welding control is claimed to reduce kva demand on resistance welding equipment. The control draws power from a three-phase line and converts it to a lower frequency single-phase for the welder.

The control is completely packaged to control all mechanical and electrical functions. It can be mounted on the floor or side of the machine. Panel is of swing-out type. WESTINGHOUSE ELECTRIC CORP., P. O. Box 868, Pittsburgh 30.

* * *



SELF-CENTERING action on weld nut afforded by circular collar. Collar fits in hole

Weld Nut

"GRIPCO" weld nuts, for use in restricted space where metal sections are too thin to thread, are now featuring a new self-centering device. This consists of a circular collar on the weld nut which fits into the bolt hole to center the nut automatically. The nut is then welded to the metal and a bolt screwed into the nut. Weld nuts are also attached to various bulky or heavy products so they can be bolted securely against shifting in transit.

Gripco "Pilot" weld nuts are furnished with common nut threads. "Double-Triangle" nuts have a thread-locking feature which locks the bolt to the nuts. GRIP NUT CO., 310-C. So. Michigan Ave., Chicago 4.

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ELECTRODES PAY THEIR WAY...

TAKE ADVANTAGE OF THESE VALUABLE ARCOS SERVICES

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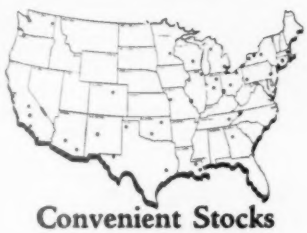


Convenient Stocks

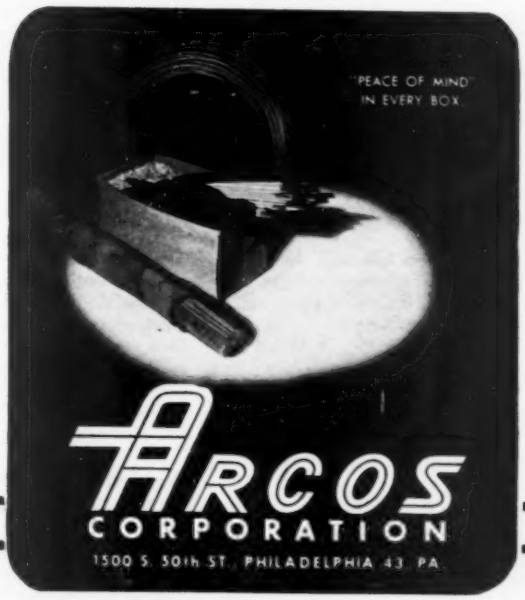
Technical Information

In our long association with stainless fabricators, we have learned that their first and last interest in electrodes is the production of sound weld metal. Arc characteristics, ease of slag removal, bead appearance are all plus qualities easily evaluated but sound welds *on every job* and *from every pound of electrodes* is vital to the user's reputation.

We have further learned, as manufacturers, that stainless electrodes of a quality which will produce sound weld metal *all the time* are achieved only through a considerable expenditure of technical skill in testing and retesting. Arcos electrodes which do not produce trouble-free welds under our strict quality control tests are rejected *before they reach our warehouse.* This extensive care to produce trouble-free electrodes is reflected in the price of Arcos electrodes.

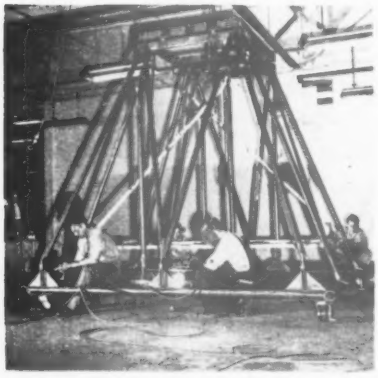
The extensive care in the Arcos processing of electrodes costs more than conventional methods used in the manufacture of low priced steel electrodes but it pays out when it eliminates the costs of chipping and rewelding or failure in service.

The best informed buyers of stainless electrodes specify Arcos.



ELECTRODES • COILED WIRE • BARE ROD

News of the Industry



BOMB-BAY tank storage racks for the B-36 are gas welded by TEMCO certified weldors

Texas Firm Completes Aircraft Welding Job

FINAL units of 160 bomb-bay tank storage racks for the B-36 bomber were recently completed at Texas Engineering and Mfg. Co., Inc., Dallas, Tex. More than 2½ miles of certified arc welding were required on these racks, fabricated from 3-in. black pipe for the base and 2-in. black pipe for the superstructure.

Each rack requires 1,006 in. of weld and measures 10 ft. 11½ in. by 11 ft. 3½ in. at the base. Height is 9 ft. 8½ in. and weight is approximately 2,000 lb. TEMCO fabricated the racks under sub-contract to Consolidated Vultee Aircraft Corp., prime contractor on the B-36.

The welding department at TEMCO includes Air Force certified weldors for oxyacetylene, oxyhydrogen, metal-arc and inert-arc welding of all steels, aluminum alloys and stainless as well as Air Force certified spot welding equipment.

* * *

Adams Alloy Co. Names Jobbers

FIVE new distributors handling the "Metalite" hard-facing alloys produced by Adams Alloy Co., Wakita, Okla., are as follows: Independent Distributing Co., St. Joseph, Mo.; Enid Equipment Co., Enid, Okla.; Mideke Supply Co., Oklahoma City, Okla.; Lubbock Equipment Co., Lubbock, Texas; and Prince Welders Supply, Portales, New Mexico.

* * *

Metal & Thermit Adds Tempil Products to Line

METAL & THERMIT Corp., New York City, has added temperature-indicating products to the lines of welding accessories it distributes. Crayon, pellet and lacquer products made by Tempil Corp. will be stocked at Metal & Thermit's district offices and through the company's distributors.

* * *

Eastern NWSA Meeting Scheduled for Sept. 29

THE National Welding Supply Association will hold its eastern zone meeting at the Hotel New Yorker on Thursday, Sept. 29. All members of the association and distributors interested in the activities of the association are invited to attend the meeting.

* * *

Fansteel Appoints West Coast Distributor

THE Henger-Seltzer Co., 120 South Hewitt St., Los Angeles 12, has been named west coast sales distributor for Weiger-Weed resistance welding electrodes, holders, tips and dies; Fansteel tungsten electrodes for inert-gas and atomic hydrogen welding; Fansteel tempered soldering tips; Fanweld hard-facing metal and Fansteel copper base alloys.

Announcement was made by Joseph A. Weiger, vice-president in charge of Fansteel sales for Fansteel Metallurgical Corp., North Chicago, Ill., and its subsidiary, Weiger-Weed & Co., Detroit.

Henger-Seltzer Co. recently moved to new and larger quarters and have enlarged their sales staff.

* * *

Federal Consolidates Welder and Press Divisions

FEDERAL Machine and Welder Co. has consolidated the operations of the Warco Press Division and the Welder Division in its plant No. 2, located on Overland Ave., just beyond the city limits of Warren, O. The plant was originally built and tooled to make medium tanks.

Since the war, resistance-welding equipment, press brakes, special machinery have been manufactured in the plant. This consolidation involves vacating the Navy-built plant known as the Warren City Mfg. Co., which has produced the press line.

* * *

Welded Homes Shipped At Rate of 24 per Day

LUSTRON Corp., Columbus, O., builder of porcelain enamel steel homes largely fabricated by welding (THE WELDING ENGINEER, July, pp. 17), recently shipped 24 of its houses in a single day to purchasers in 14 states.

The shipment equaled the daily production for one shift.

Lustron employs 3,414 persons, including 2,595 in the factory and 819 in offices. The monthly payroll averages $880,000.

* * *

SEAM WELDING one of 7,400 droppable aluminum fuel tanks at Curtiss-Wright for Navy fighting planes. Tanks formerly were steel

7,400 Airplane Fuel Tanks Welded at Curtiss-Wright

THE LAST seam-welded droppable fuel tank in a Navy contract for 7,400 was recently completed at the Curtiss-Wright Corp. plant in Columbus, O. More than 35 miles of seam welding, 10,482,000 spot welds and 63,133 ft. of gas welding went into the tanks. Eight sets of seam welding wheels were worn out.

Made of aluminum, the tanks are carried under the fuselage or on the wingtips of Navy fighting planes and may be dropped when full or empty. The Navy formerly produced the tanks from sheet steel at one of its factories.

First tank of the original Curtiss-Wright order for 5,000 was delivered to the Navy on Oct. 10, 1947. Additions to the contract totaled 2,400 tanks. Maximum production rate was 728 tanks per month after all seam, spot and gas welding procedures had been certified by Navy inspectors.

* * *

New Welding Firm at Cincinnati

THE Inter-State Welding Supply Corp., Cincinnati, was recently incorporated to engineer and sell welding equipment. A building is being remodeled for the firm to occupy. E. L. Foote is president, E. R. Walsh, vice-president, and N. L. Weaver, secretary-treasurer.

* * *

Columbus Distributor Moves to New Address

Williams & Co., Inc., 31 North Grant Ave., of Columbus, O., welding distributors, have moved to 851 Williams Ave., Columbus 12.

the trend is to N-A-X HIGH-TENSILE STEEL for

BUMPERS • GRILLES • HOODS
FENDERS • BODY PANELS • DECK LIDS
FRAMES • BRACINGS • WHEELS • HUB CAPS
AND OTHER AUTOMOTIVE PARTS

for **High Strength • Finer Grain Structure • Good Formability • Great Impact-Toughness • Excellent Weldability High Corrosion-Resistance • High Fatigue-Resistance**

N-A-X HIGH-TENSILE MEETS ALL REQUIREMENTS OF S.A.E. 950

Specify N-A-X HIGH-TENSILE STEEL

GREAT LAKES STEEL CORPORATION

N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
Unit of National Steel Corporation

Dockson's No. 1250
Turretype Arc Welding
Helmet shown here.

Dockson
WELDING &
SAFETY EQUIPMENT

You get service-plus from DOCKSON "Better Built" Welding and Safety Equipment. Selected materials, experienced engineering and practical construction give you the BEST PERFORMANCE and MODERATE COST.

There is a DOCKSON distributor near you. Name on request.

Write for catalog of complete Welding and Safety line.

DOCKSON CORP. • 3839 Wabash • Detroit 8, Michigan

WHY IS THE OXO REGULATOR THE BEST IN THE WELDING INDUSTRY?

Because it stays in service longer, is more economical to maintain, and is the easiest Regulator to repair.

To the right—FRONT VIEW
Below—REAR VIEW

OXO WELDING EQUIPMENT CO. TRADE MARK

Shock and rough handling in no way damages the efficiency of this pressure regulator —it is built to "take it." Nozzle, seat, seat pin, spring, and filter incorporated as one unit is an exclusive feature of OXO . . . it can be replaced in record time of two minutes.

Underwriters Laboratories approved.

OXO
WELDING EQUIPMENT CO.
(Dept. 99)
1235 W. 95th St. Chicago 43, Ill.

J. F. Wagner Heads Oxygen Association

J. F. Wagner of Cleveland, O., was elected president of the Independent Oxygen Manufacturers' Association at their annual meeting held at the Manoir Richelieu, Murray Bay, Quebec, Canada, on July 11-13.

Mr. Wagner is vice-president in charge of production of The Burdett Oxygen Co. of Cleveland, Inc., one of the largest independent producers of industrial gases in the country. He is also vice-president of the Burdett Oxygen Company of California and vice-president of The American Industrial Safety Equipment Co., a subsidiary of Burdett located at Brooklyn, N. Y.

He is active in the Compressed Gas Association, the International Acetylene Association and is now secretary-treasurer of the Cleveland section of the American Welding Society, a post he has held for four years.

• • •

Resistance Welding Outlook Cheerful, RWI Reports

A recent nation-wide survey by the Resistance Welding Institute, Cleveland, O., indicates a considerable expansion in the use of resistance-welding equipment.

Cost-conscious management is becoming more aware of the savings accruing in production time and product cost when resistance welding is properly utilized. With the high cost of labor generally regarded as a permanent price factor, only the cost of materials and the process of manufacturing are considered available for serious cost-cutting operations.

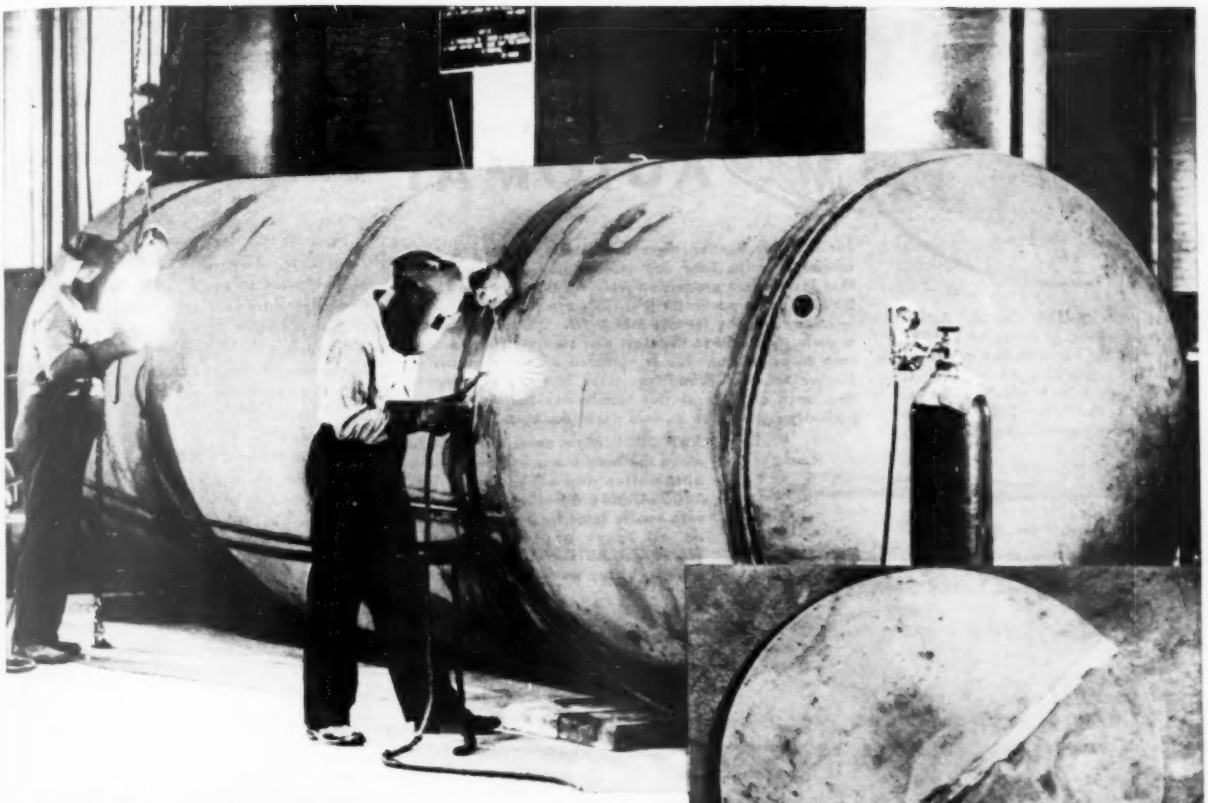
Commenting on the survey results, B. L. Wise, president of the Resistance Welder Manufacturer Association, said: "Resistance welding has scored its major successes in the so-called 'new industries' such as automobiles, radios, refrigerators and the like where competitive pricing factor has always been important. Now that markets have tightened, the 'old line' metal industries are more seriously exploring the redesign of products for resistance-welded fabrication."

• • •

Complete 3-Year Program On Welding Arc Research

Three members of the faculty of Rensselaer Polytechnic Institute, Troy, N. Y., have completed a three-year program for developing instruments to measure the stability of the welding arc. Their findings were presented in a paper before the summer general meeting of the American Institute of Electrical Engineers, which was held at Swampscott, Mass., the latter part of June.

The project, sponsored by the Bureau of Ships, was carried on by Lauriston P. Winsor, assistant professor of electrical engineering at Rensselaer; L. McDonald Schetky, research fellow in metallurgy, and Robert A. Wyant, associate professor in the department of metallurgical engineering. While the major project is complete, a pilot program will be kept open in the welding laboratories of the institute.



Semi-circles are welded together to form tank head blanks

150 FEET
of Everdur Welded Seams
IN 4,000-GALLON LIQUID OXYGEN TANK

L'Air Liquide Society Montreal, Canada, fabricates large Everdur storage tank for U.S. coal mine by inert-gas-shielded arc welding

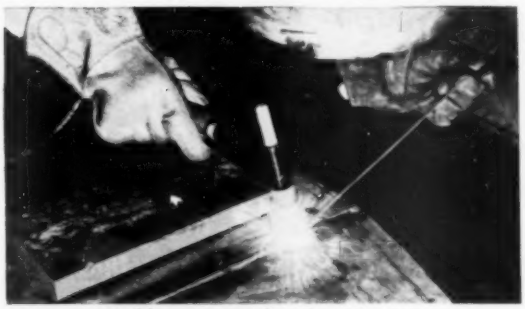
FOR FASTER WELDING, at lower amperages, and without jigs, L'Air Liquide Society decided on Argowelding for this Everdur* tank. Water-cooled, manually-operated torches were employed with standard D.C. welders on straight polarity for a total of more than 150 feet of seams.

To secure the six-foot discs required for the heads**, Everdur semi-circles were welded with strips of parent metal and the resulting circles dished to a 13″ radius and lipped. Girth seams, longitudinal seams and welding of the heads to the shell were completed with Everdur 1010 welding rod.

For detailed information on high-strength, corrosion-resistant Everdur Alloys, write for Publication E-5. Anaconda Publication B-13 discusses Anaconda Welding Rods and their applications.

**Circles up to 156″ dia. available from The American Brass Company's U.S. mills.

*Reg. U. S. Pat. Off.



Welding seams on liquid oxygen tank

Photos, Courtesy Canadian Liquid Air Co., Ltd., Montreal, Canada

ANACONDA

Anaconda

WELDING RODS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

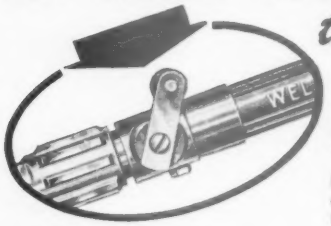
Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.

for Mass Production Welding

there's no torch like the

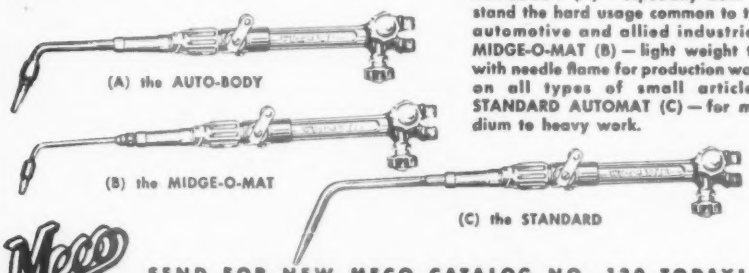
Meco AUTOMAT



The famous MECO "On-Off" Action (above) allows a tiny pilot light to burn at the tip with the action in the "off" position. At a touch it flashes to full production flame. Action tested over 200,000 times without appreciable sign of wear.

For mass production there is no such thing as a good all-round torch. Time and motion studies have proved that for efficient production welding, the torch used must be fitted to its particular job. The Meco AUTOMAT family — embodying the famous MECO "On-Off" action (oval), is perfectly suited to the start and stop welding so common to production. The importance of this time saving feature to mass production work is apparent. Beyond this, each member of this family has built-in features perfectly suiting it to its own particular class of welding.

AUTOBODY (A) — especially built to stand the hard usage common to the automotive and allied industries. MIDGE-O-MAT (B) — light weight tip with needle flame for production work on all types of small articles. STANDARD AUTOMAT (C) — for medium to heavy work.



(A) the AUTO-BODY

(B) the MIDGE-O-MAT

(C) the STANDARD

Meco

SEND FOR NEW MECO CATALOG NO. 130 TODAY!

Modern Engineering CO., Inc.

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A welding arc as seen through a Shade No. 12 ordinary welding lens. Note ... the glare and lack of visibility of the work.

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ARC GLARE IS ELIMINATED WITH

AGILE METALKLAD Welding Filter Plates

A welding arc as seen through a Shade No. 12 METALKLAD WELDING LENS. Note ... the absence of glare and the clear visibility.

42% MORE VISIBILITY

15-50% MORE EFFICIENCY

100% EYE PROTECTION

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For maximum efficiency, safety and production, equip the welding helmets of your welders with METALKLAD ARC WELDING FILTER PLATES. Available in any quantity or density. As different from ordinary welding lens as day from night. Mail the coupon for complete literature.

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Undergraduate Engineers Given Lincoln Awards

AWARDS and scholarships totaling $6,750 were presented in July to engineering undergraduates and their colleges at the closing of 1948-49 competition of the Annual Engineering Undergraduate Award and Scholarship Program sponsored by the James F. Lincoln Arc Welding Foundation.

First award of $1,000 was presented to Robert K. Allen and Alvin H. Kasberg, both seniors in the Department of Mining and Metallurgy at the University of Wisconsin. Funds for four scholarships for $250 each will be established at Wisconsin in honor of these students. Title of the winning paper was, "A Study of the Welding Characteristics of Aluminum Bronze Electrodes."

Second prize of $500 was won by George W. Grossman, a senior in the department of Engineering Administration at the Case Institute of Technology. Two scholarships worth $250 will be set up at Case in honor of Mr. Grossman.

The $250 third award was given to John S. Baer, a senior in the Department of Mechanical Engineering at Iowa State College for his paper entitled, "The Design of an Arc Welded Forming Die." A single $250 scholarship in Mr. Baer's name will be established at Iowa State.

In addition to these main awards, smaller awards were given to 77 other undergraduates. Judges of the papers were Dr. E. E. Dreese, chairman of the board of trustees of the Lincoln Foundation and chairman of the department of electrical engineering at Ohio State University; Professor B. H. Jennings, head of the department of mechanical engineering at the Technological Institute of Northwestern University, and Professor Frank D. Carvin, director, department of mechanical engineering, Illinois Institute of Technology.

* * *

Hard-Facing Distributors Announced by Stoody

THE entire line of Stoody hard-facing alloys will be handled by Morris, Wheeler & Co., Fox St. and Roberts Ave., Philadelphia, and Silver Welding Supply Co., 1758 Centre St., Boston, Mass. The Stoody Co. is at Whittier, Calif.

Morris, Wheeler & Co. will cover eastern Pennsylvania, New Jersey, Delaware and Maryland. Silver Welding Supply will serve the eastern half of Massachusetts.

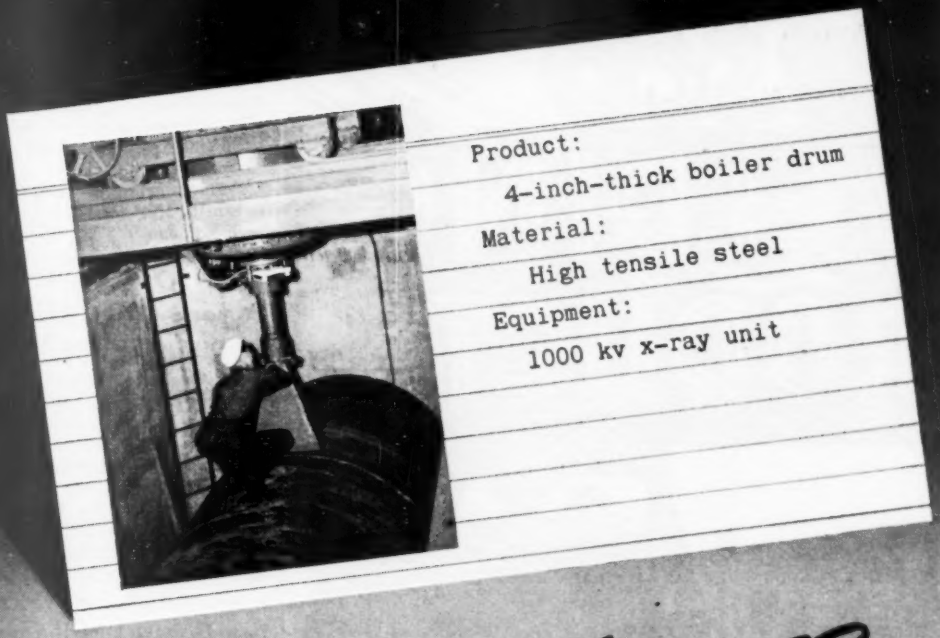
* * *

Torit Mfg. Co. Adds Fabricating Dept.

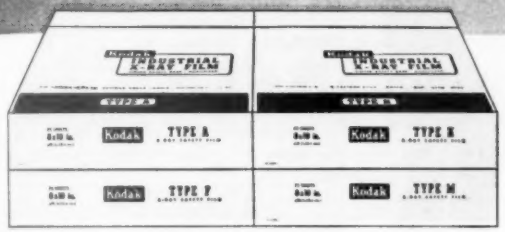
THE Torit Mfg. Co., St. Paul, Minn., is completing consolidations and rearrangements in its plant for a new sheet-steel fabricating department. To gain more room for fabricating operations, new storage space is being constructed for oxygen and acetylene cylinders handled by Torit's welding equipment and supply division, St. Paul Welding and Mfg. Co.

In addition to dust-collecting equipment for grinders, polishing machines, etc., Torit manufactures dental supplies and equipment.

WHAT'S THE RIGHT X-RAY FILM?



ANSWER:



KODAK INDUSTRIAL X-RAY FILM, TYPE A

● To examine such a dense and thick material the radiographer takes advantage of Kodak Industrial X-ray Film, Type A. For, in order to keep exposure reasonably short, the high speed of this film is essential. At the same time, its high contrast and fine graininess enable him to take full advantage of the ability of the 1000 kv machine to detect weld irregularities.

A TYPE OF FILM FOR EVERY PROBLEM

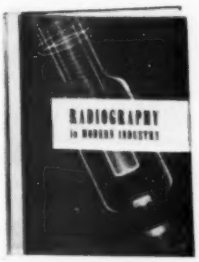
To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film. They provide the means to check welds efficiently and thus extend the use of the welding process.

Type A—has high contrast with time-saving speed for study of light alloys at low voltage and for examining heavy parts at 1000 kv. Used direct or with lead-foil screens.

Type M—provides maximum radiographic sensitivity, under direct exposure or with lead-foil screens. It has extra-fine grain and, though speed is less than in Type A, it is adequate for light alloys at average kilovoltage and for much million-volt work.

Type F—provides the highest available speed and contrast when exposed with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead screens.

Type K—has medium contrast with high speed. Designed for gamma ray and x-ray work where highest possible speed is needed at available kilovoltage without use of calcium tungstate screens.



RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practice, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price, $3.

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Amsco WELDING PRODUCTS

Amsco NICKEL-MANGANESE

Amsco Nickel-Manganese filler bars and electrodes built up this dipper used in the rugged service of a northern iron ore mine. For buildup and repair work on manganese steel, Amsco Nickel-Manganese will provide a long-wearing surface to resist heavy impact and abrasion. Nickel-Manganese electrodes are cold drawn rods, provided either coated for D.C. and A.C. or bare for D.C. welding. Weld deposits surface harden to 450-550 Brinell under cold working and have a toughness and ductility which approaches that of standard 13% manganese steel. Drilling sheaves, spindles, crossings, wobblers, crushers, and hammer mills are other applications where Nickel-Manganese has proved its value. Amsco cast and rolled repointer bars, plates, and hardfacing rods are also available. Write for Bulletin 10-A and W-1 for sizes and types of bars.

Ask for new booklet: "The Metallurgical Background for Welding Manganese Steel"

Brake Shoe

AMERICAN MANGANESE STEEL DIVISION

302 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo. Offices in principal cities. Made and sold in Canada by Canadian Ramapo Division of Joliette Steel Ltd., Niagara Falls, Ont.

FCC Inert-Arc Order Postponed to Jan. 31

AN ORDER for applying rules respecting radio interference from inert-arc welders had its effective date postponed to Jan. 31, 1950 at a July meeting of the Federal Communications Commission. This action allows the continued manufacture and sale of high-frequency-stabilized arc welding equipment.

Postponement was granted by the FCC to provide time for further investigation of such equipment. The problem has been under consideration since April, 1948.

* * *

Compressed Gas Association To Hold Canadian Meeting

THE Canadian section of the Compressed Gas Association will hold its annual meeting at the Bigwin Inn, Lake of Bays, Ontario, on Sept. 8-10, 1949. All members of the association, including those from the United States, are invited to attend. Arrangements at the Inn must be concluded well in advance, so it is asked that members notify the association of their intention of attending.

* * *

New Hobart Distributor Appointed at St. Louis

J. E. WHITE, 1802-1808 South Seventh St., St. Louis, Mo., has been named distributor for Hobart Brothers Co., Troy, O., in a number of counties in Missouri and Western Illinois. The St. Louis firm will distribute the complete line of Hobart arc welders, accessories and electrodes under the name of Hobart Welder Sales & Service.

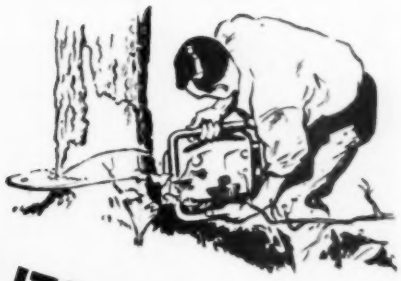
* * *

Photo courtesy Air Reduction Sales Co.

ELECTRONIC tracing device guides flame cutting machine in Buffalo, N. Y., warehouse.

Ryerson Installs Flame-Cutting Equipment

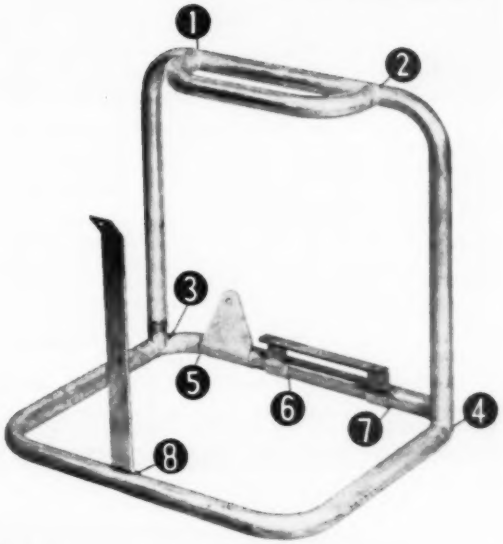
JOSEPH T. RYERSON & SON, INC., warehouse steel company, has completed installation of 11 flame-cutting machines, each equipped with an electronic tracing device. These machines have been installed in Ryerson plants from coast to coast to supply the demand for intricately shaped steel parts.



HOW THE TIMBERHOG GETS ITS STRONG BACK

The TIMBERHOG is a gasoline chain saw—product of Reed-Prentice Corp., Worcester, Mass. It has a 4 h.p. gas engine and chain speed of 1200 feet a minute. It can buck through a 16″ log in 40 seconds—and cut down a 29″ tree in 3 minutes flat. It can keep on cutting down timber and cutting it up, all day long, every day.

An outstanding feature is the exceptional combination of light weight, great strength and durability that has been achieved in the TIMBERHOG—especially in its EASY-FLO brazed "back"—the tubular steel frame that holds it all together.



EASY-FLO BRAZED CONSTRUCTION DOES IT!

It provides not only the required high strength, but also the fast production demanded by a schedule calling for 24,000 frames, totaling 192,000 EASY-FLO joints. Joints 1 and 2 are brazed simultaneously by induction, time 45 seconds—3 and 4 by gas-air in 75 seconds—⇄5 by induction in 13 seconds—6 and 7 by induction in 23 seconds—⇄8 by induction in 11 seconds. EASY-FLO 45 is preplaced at the joints in ring or shim form and the production set-up reduces the brazing to a push-button proposition. To date *not a single joint has failed in service.*

If you'd like the eye-opening details about EASY-FLO brazing just write today for Bulletins 12-A and 15. They'll be mailed to you promptly.

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THIS IS LOW COST WELDING!

When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal — giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding — constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt and rotating bearings, choice of two base styles, and many other features — are built into C-F Positioners.

C-F Positioners are available in Hand or Power operated models, and are made in capacities up to 30,000 lbs. and larger.

Write for the new C-F Positioner Catalog.

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C-F positioned welds mean better, more economical welds

For HIGH TENSILE STRENGTH, MACHINABLE WELDS

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PLAIN AND ALLOY CAST IRON
WELDING RODS
ELECTRODES • MOLY RODS

- Perfect Color Match
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Cast Welding Rods
CAST ALUMINUM RODS & FLUXES

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"Dependable Since 1897"
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Electrical Engineering Program Expanded at Battelle

BATTELLE Memorial Institute, Columbus, O., has embarked on an expanded program of research in electrical engineering with the completion of a new laboratory area and enlargement of its staff.

Battelle studies in electrical engineering will include circuits, electrical machines, instruments, service mechanisms, analogue computors, ultrasonics, X-rays, electromagnetic fields, high-frequency equipment, materials testing, development of electrical conducting and magnetic materials testing, development of electrical conducting and magnetic materials, the design of systems involving non-linear magnetic and semiconductor circuit components and illuminations.

Dr. Robert C. McMaster is in charge of Battelle research in electrical engineering. For companies not equipped to conduct research on complex electrical engineering problems, Battelle will perform research on a cost basis.

* * *

Indianapolis Firm Enlarges Facilities

THE Indus Tool and Mfg. Corp., Indianapolis, Ind., recently changed its name to The Indus Corp. and opened a new assembly plant at Greencastle, Ind., which will handle the fabrication and assembly of stampings and welded metal products.

The Indianapolis plant will continue to function as a general machine shop specializing in the manufacture of special machinery. Products of the Indus Corp. consist of a power seeder, an aluminum live-bait cooler and a metal spinning lathe.

* * *

Metal Spraying Shop Added to Plant

L. O. KOVEN & Brother, Inc., Jersey City, N. J., manufacturers of boilers, tanks and special weldments, has added a metal spraying shop to its facilities. Coatings of lead, zinc, babbitt, tin, copper, nickel, carbon steel, Monel, etc., can be sprayed.

"Fine time to run out of oxygen!"

"Don't Gamble!"

Eye injuries amount to about one-third of industrial accidents. Yet with proper precautions 90% of these can be prevented. All too many seem to be gambling on their good luck—and with disastrous results. Far better to follow the recommendations of safety experts and choose the right protection for each job.

For Gas Welding, Cutting, and Brazing, Jackson Headrest Goggles type W-50 are light and easy to wear, with or without prescription glasses, are simple and easy to adjust, easy to raise and lower.

Goggle assembly is hinged from headrest with telescopic arms, held gently against the face by concealed springs. Spring clips hold arms to headrest to provide added adjustment and easy replacement. Headrest of light, easy to clean plastic, adjustable for size.

Plastic eye cups easily fitted to the face. Outside of each cup has ventilating screen to prevent fogging and baffle plate to keep flying particles and light rays out. 50 mm. glass lenses are available in standard shades from 3 through 6, and have cover glasses to protect them.

Sold only by distributors and dealers in the U.S. and Canada. Write us for information.

Type WR-50, same as W-50 but with Elastic Head Band

Headrest Goggles G-50 with Clear Lenses for Chipping and Grinding

Type GR-50, same as G-50 but with Elastic Head Band

SAFETY GOGGLES · SPECTACLES · EYESHIELDS

JACKSON PRODUCTS

WARREN · MICHIGAN

Salt Lake Distributor Handles Nelson Line

NELSON stud welding equipment will be distributed in the states of Utah, Montana and portions of Idaho, Wyoming and Nevada by the Industrial Supply Co., Inc., Salt Lake City, it is announced by Nelson Stud Welding Division of Morton Gregory Corp.

Industrial Supply is one of the leading welding distributors in the mountain states, serving many construction, railroad and manufacturing industries in this area. The firm will also serve as exclusive rental agents for the Nelson stud welding gun.

* * *

Tank Stocking Points Added by Black, Sivalls & Bryson

NEW stocking points for field-welded steel storage tanks, treaters and oil and gas separators have been established in Texas and Michigan by Black, Sivalls & Bryson, Inc., Kansas City, Mo. The new Snyder, Texas, office will be in charge of William A. Watkins, sales and service man formerly at the company's Lafayette, La., branch.

For the accomodation of customers in the Pentwater field in Michigan, an office will be opened at Mears, Mich. Mears is located 108 miles west of Mount Pleasant, Mich., where the company has a branch sales department.

* * *

Australian Business Good, Lincoln Man Reports

VAST iron ore deposits and ample coal resources back up mushrooming industries in Australia, it is reported by William I. Miskoe, managing director of Lincoln Electric Co.'s Sydney plant. Because of this inexpensive steel, capital and technical men are flowing to the country "down under" in record quantities.

Though taxes are high—his own are 50%—Mr. Miskoe says that the Australian Labor government is otherwise cooperative in all business matters. Wages are low in Australia, where tool makers get only $30 per week, but to offset this, five-room cottages rent for $25 per month and filet mignon costs 54 cents a lb.

American business men should develop Australian trade now, in Mr. Miskoe's opinion, because after world conditions get completely back to normal, the opportunities may have completely passed.

* * *

30,000-Ton Welded Tanker Launched in June

THE *Bulkoceanic*, a 30,000-ton all-welded tanker, was launched recently at the Welding Shipyards, Inc., at Sewalls Point, Va. The ship is a sister of the *Bulkoil*, now engaged in carrying oil to foreign ports.

More than 629 ft long and 84 ft abeam, the new vessels are said to be the largest of their type in the world. The keel of a fourth tanker of the same size was laid in early July.

It's like putting money in the bank . . .

when you use

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Hard-Surfacing WELDING ELECTRODES for Armoring Manganese and Carbon Steel Parts!

Seaco hard-surfacing prolongs the life and reduces cost of parts subject to severe impact and abrasion! Repairs made with Manganal and protected with Seaco, outlast new parts! A Seaco surface allows Manganese steel to work-harden before wear hits it. Never softened by dilution from parent metal. Brinell hardness 500-600. Available in 3/16" and 1/4" diameters. 12-inch lengths.

Practical Applications

- Hammers
- Crusher Parts
- Shovel Teeth and Lips
- Bulldozer Blades and Grousers
- Fly Ash Fan Blades
- Clamshell Bucket Lips
- Pumpshells and Impellors
- Armoring MANGANAL Build-Ups

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FREE! Write for copy of "Manganal Marketer" today!

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The
KENT
SUCTION CLEANER
for
FLUX RECOVERY

Pays for itself by salvaging valuable flux!

This compact, easily portable machine can be adapted to any type of welding application.

The KENT SUCTION CLEANER

The Kent Suction for Flux Recovery picks up the unfused flux and small fused particles from the weld. The fused particles are automatically screened out of the flux and the fine dust is removed—clean flux is then deposited in the lower tank ready to be returned to the automatic welder as needed.

You're invited to visit the KENT Display
NATIONAL METAL EXPOSITION
AND CONGRESS
Oct. 17-21, 1949 Public Auditorium, Cleveland, O.
BOOTH 2644

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About People

MALCOLM S. CLARK has resigned as president and member of the board of directors of The Federal Machine and Welder Co. He has been succeeded by A. S. BLAGDEN of Nashville, Tenn., who was named executive vice-president of Federal in July. Prior to joining Federal, Mr. Blagden served as president of Keesby and Madison Co., Philadelphia, and president of Beaver Products Co., Buffalo, N. Y.

* * *

E. E. GOEHRINGER has been named district manager at Indianapolis for the Lincoln Electric Co., Cleveland. OMER BLODGETT has been transferred to the Chicago office where in addition to his duties as sales engineer, he will work on engineering applications for redesigning to welded steel fabrication. R. L. HALL and ROBERT HIRSCH have been assigned to Lincoln Pittsburgh office as district engineers.

* * *

J. B. DAVENPORT, formerly assistant manager of the Detroit district of Air Reduction Sales Co., has been appointed assistant manager of the Charlotte district. J. H. HART, formerly assistant sales manager at Detroit, replaces Mr. Davenport. R. A. JAMIESON succeeds Mr. Hart. A. S. BLODGET, JR., has been named assistant manager of the Boston district.

* * *

HARRY A. DENNIS has been appointed sales manager of the weldment division in the midwestern area for Graver Tank & Mfg. Co., Inc., East Chicago, Ind. Mr. Dennis was formerly with Lukens Steel Co. and their By-Products and Lukenweld Divisions. Starting in 1939 with Lukens as a helper in the open hearth, he later became a welding research engineer and did welding service engineering. He has a B. S. from Pennsylvania State and is a member of the American Society for Metals and the American Welding Society.

* * *

L. B. DOBBINS has been appointed supervisor of plant engineering for Air Reduction Sales Co. He will administer plant engineering matters not assigned to the general engineering division and in addition will act as liaison between operating, research and engineering departments. He was formerly superintendent of the Johnstown tonnage oxygen plant where he will be replaced by J. C. WHITE.

* * *

H. A. OSBORNE has been named manager of the Welding Fixture Division of Morton Mfg. Co., Muskegon Heights, Mich. OREN G. RUTEMILLER has been appointed chief engineer of the company in charge of all design engineering.

* * *

CHARLES H. GALLAWAY, sales manager of American Optical Company's safety products division, was elected vice-president of the association.

SPOT WELDERS

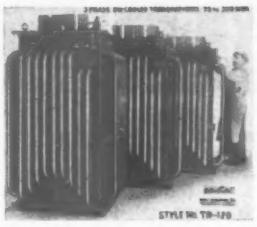
BUTT WELDERS
GUN WELDERS
WELDING TIPS

•

Eisler manufactures a complete line of RESISTANCE SPOT WELDERS for all types of Welding. SIZES FROM ¼ to 250 KVA

•

TRANSFORMERS



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JOHN E. FEESER has been named general manager of the American Industrial Safety Equipment Co., Brooklyn, N. Y., a wholly-owned subsidiary of The Burdett Oxygen Co., Cleveland.

* * *

ARY DE AZEVEDO BLOEM has joined The Bastian-Blessing Co., Chicago, in the export division of RegO Sales. A native of Brazil, Mr. Bloem was educated in Sao Paulo and first came to the United States in 1920. He has held posts in the export organizations of such companies as Socony-Vacuum Oil Co., The Rubber Development Co. and Pan American Commerce, Inc. SAMUEL ELDON MCTIER has joined Bastian-Blessing as a sales engineer to represent RegO in Illinois, Michigan, Iowa and eastern Missouri.

* * *

CHARLES S. FREEMAN has been appointed sales representative for the Reed Engineering Co., St. Louis, for special welding jigs, turning rolls and fixture in the Buffalo, N. Y., area. Mr. Freeman was with Lincoln Electric Co. until March, 1948, when he started his own business as a manufacturers agent and welding consultant.

* * *

A. J. RINNANDER, formerly with the Chicago Pneumatic Tool Co., New York City, has become a member of Harnischfeger Corp., Milwaukee.

* * *

WILLIAM A. MARSTELLER and ROBERT P. MELIUS have been elected vice-presidents of Rockwell Mfg. Co., Pittsburgh. Mr. Melius was recently placed in charge of sales for the newly created Power Tool Division. Mr. Marsteller for the past several years has been manager of advertising and market research for the company.

* * *

JOHN P. MCARTHUR has been appointed manager, west coast sales, for Worthington Pump and Machinery Corp., Harrison, N. J., with headquarters in San Francisco.

* * *

FREDERICK P. BERNHARD, comptroller of The International Nickel Co., Inc., retired August 1 after 50 years of consecutive service with the company.

* * *

Died . . .

JOHN VOGEL, 72, owner of the Standard Welding Co., Kalamazoo, Mich., died Aug. 1 while driving his car. The vehicle was traveling only about 15 mph, jumped the curb and hit a tree. It was determined Mr. Vogel died before his auto struck the tree. Mr. Vogel was born in the Netherlands and lived in Kalamazoo for 56 years.

* * *

GRANT D. SEATON, 68, who retired three years ago as district sales manager for Linde Air Products Co. at Seattle, Wash., died on June 22. Born near Chicago, he had lived in Seattle for 30 years.

* * *

EDWARD J. BURNELL, vice-president and general sales manager and director of the Link-Belt Co., died on July 22 at his home in Winnetka, Ill. He was 61 years old.

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Quick-On Quick-Off

ATTACHMENT

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Combination SKULLGARD WELDING HELMET

This unique M.S.A. development permits instant attachment or removal of the Welding Helmet without removing Skullgard from head, enabling continuous head protection on the job. Helmet has spring-catch attaching posts, which slide into lugs on Skullgard and hold Helmet firmly in place. Light pressure on posts retracts catches, instantly freeing Helmet from the assembly. Conversion sets available for assemblies now in service. Bulletin CO-2.

FEATURES

- **Combined Skullgard-Helmet Protection.**
- **Helmet Attached to or Removed from Skullgard While Skullgard is being Worn.**
- **Head Protection Every Minute On the Job.**
- **Simple, Practical, No Loose Parts!**

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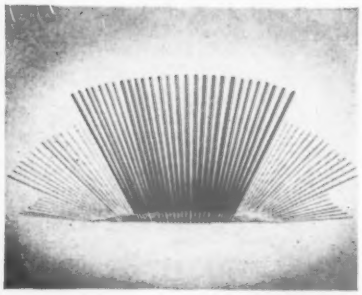
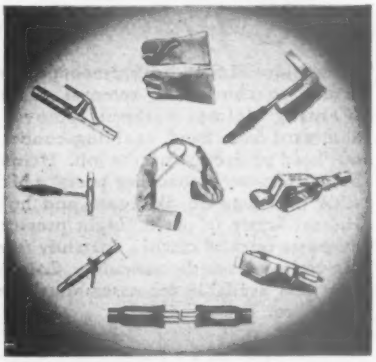


DESCRIPTIVE literature covering mild steel, low alloy and special steel, stainless steel, hard surfacing and build up and other special electrodes is available to those requesting full information on M & T's "SELECT 70"— seventy electrodes designed to cover all arc welding requirements—AC or DC, all-position or downhand work welding of mild steel, low alloys and stainless steels as well as hard surfacing and building up of worn parts.

Literature is brief but comprehensive, covering specifications, properties and applications for each electrode. Copies available on request received on company letterhead. Address Metal and Thermit Corporation, 120 Broadway, New York 5, N. Y.

ACCESSORY DIVIDENDS DECLARED

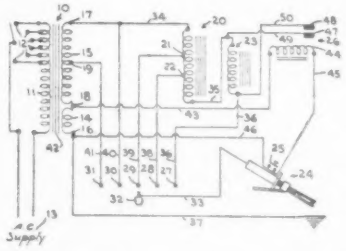


UNDERSCORING the importance of proper accessories to top welding performance, more and more fabricators are taking pains with selection of accessories. Speedier, lower cost, safer and improved welding are assured when such items as helmets, shields, holders, connectors, cleaning tools and protective clothing are carefully selected. And more and more fabricators—sold on M & T electrode and arc welder performance — are specifying the M & T line of "accessories to the perfect weld." For descriptive literature, address Metal and Thermit Corporation, 120 Broadway, New York 5, N. Y.

From the Patent Office

Welding Circuit

2,464,679. ALBERT C. FLETCHER and DONALD LLOYD, Oklahoma City, Okla. Filed Oct. 16, 1945. Issued March 15, 1949.

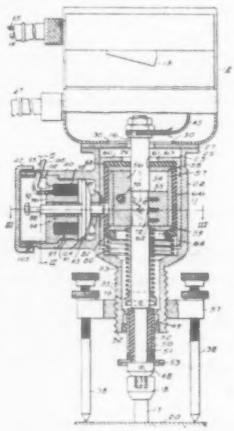


Patent pertains to a welding circuit in which the output current from the secondary is reduced by a reactance. Welding operator's switch on the electrode holder short circuits the reactance when welding is about to start so that current will be high enough to start an arc. Switch also supplies, at operator's will, increased currents for heavier welding without his having to shift the output current range of the welder.

• • •

Stud Welder

2,467,723. KENNETH F. BARLOW, Preston, England. Assigned to the English Electric Co., Ltd., London. Filed April 19, 1947. Granted April 19, 1949.



Patent pertains to a stud welding gun which has a cylindrical body housing with a reduced extension at one end. A sleeve is slidably positioned with the body. Springs bias the sleeve relative to the body portion. A clutch is positioned within the sleeve and a spindle projects from the reduced extension to engage it. An additional spring positions the sleeve relative to the spindle.

NOW!
A 170 Amp. AC Welder for $123.50!
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2. Handles from 1/16" to 5/32" rod.
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- Windshield Wiper Body

• MACHINE PARTS
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- Electric Hoists
- Time Recorder
- Paint Sprayer
- Coal Stokers
- Mixers
- Motor and Gear Housings
- Vending Machines
- Pressure Lubricator
- Rotary Press
- Printing Press
- Escalator Treads
- Gears
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Contact your nearest Jobber. If they cannot supply you, send order direct, giving Jobber's name.

F. R. FAULK, Distributor
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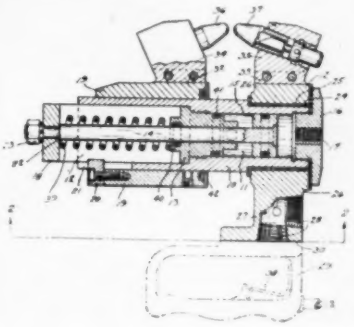
Spot Welder

2,467,628. Louis R. O'Neill, Warren, O. Filed Oct. 1, 1948. Granted April 19, 1949.

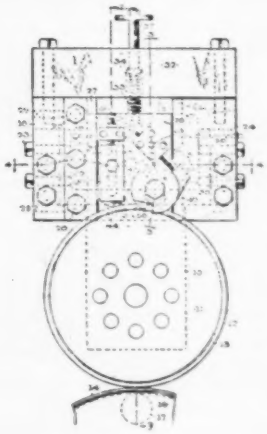


In this spot welding machine, pressure is applied to the parts to be welded. It includes a body member having a chamber formed in it and means for introducing fluid pressure into it. A piston in the chamber has a rod connected to it and extending out of the chamber. Another body member of current conducting material is positioned around the chamber for reciprocal movement on it and is connected to the piston. A frame of current conducting material is positioned on the body member and insulated from it. Means on the secondary body member and on the frame are in oppositely disposed aligned relation for receiving welding electrodes.

* * *

R-W Electrode Dresser

2,467,027. Joseph Glandis, Chicago. Assigned to Rheem Mfg. Co., San Francisco, Calif. Filed July 16, 1948. Granted April 12, 1949.



Patent pertains to a cleaning and trimming device for the wheel on a seam welding machine. The cleaning member is spring mounted on the welder for movement toward and away from the electrode. Conditioning means are mounted upon the member and urged into contact with the peripheral face of the electrode to maintain it in good condition. Other means mounted on the member trim the electrode to a predetermined contour.

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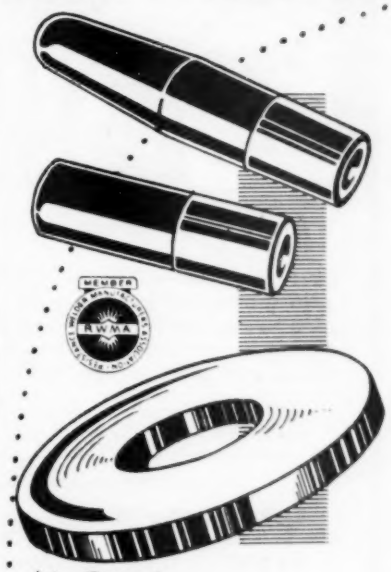

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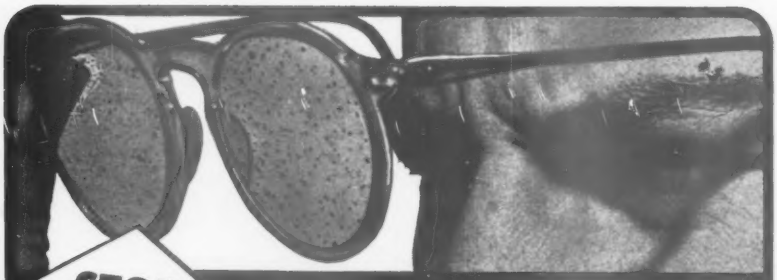

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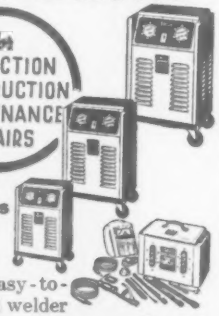

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DEPT. AR-39
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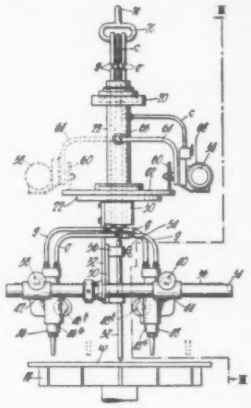
17 East 23rd Street — Chicago 16, Illinois

Circle Cutting Machine

2,463,408. LANSING MILLIS, Ben Avon, Pa. Assigned to American Bridge Co. Filed Oct. 3, 1946. Issued March 1, 1949.



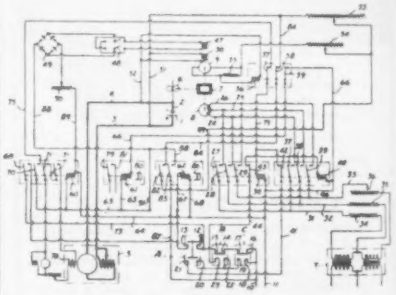
A flame cutting machine comprises a horizontal table to support a flat workpiece, a vertical pedestal spaced from the table and an arm carried by the pedestal and overhanging the table.

A vertical shaft is journaled in the arm and has a bracket attached to its lower end. The lower end of the shaft is offset from the rotational axis of the shaft in two directions perpendicular to each other. A horizontal supporting bar is carried by the lower end of the bracket. The bar carries a cutting torch which can cut work-pieces a distance equal to the offset of the bar from the table. The cutting torch is inset from the bar rotational axis of the shaft.

* * *

Arc Welder

2,468,570. JAMES K. NYBURG, East Cleveland, O. Assigned by mesne assignments to General Electric Co., Schenectady, N. Y. Filed May 10, 1946. Granted April 26, 1949.



An automatic arc welder has manually operable means for controlling energization of the welding circuit and movement of the up-and-down drivers for the electrodes. Means are provided that are responsive to variations in voltage across the arc for varying the speed of one of the drivers. A relay is connected across the welding circuit and the arc established in it is responsive to a current flow which is in excess of that which normally flows. The relay is connected to the driving mechanism of the up driver.